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BOTANIC GARDENS
and
NATIONAL HERBARIUM

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The
Australian Naturalist

Journal and Magazine of
The Naturalists' Society
of New South Wales.

EDITED BY THOS. STEEL, F.L.S.

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1914.

THE NATURALISTS' SOCIETY
OF NEW SOUTH WALES.

**ROYAL SOCIETY'S HOUSE, ELIZABETH STREET,
SYDNEY.**

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The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

NOTICES.

MEETING, FEBRUARY 3rd—

A Lecture on "Seabirds," illustrated with lantern slides —W. Finigan, Hon. Sec. Gould League of Bird Lovers.

MEETING, MARCH 3rd—

"Nature and the Mechanistic Conception of Life." —G P. Darnell-Smith, B.Sc., F.C.S., F.I.C.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE
Australian Naturalist.

Vol. III. JANUARY 6, 1914. Part 1.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

7th October, 1913. Mr. A. G. Hamilton (president) in the chair. The following were elected members:—Misses Clark, T. Hughson, McMahon, A. Richardson, L. Wallace, and Winn; Dr. J. R. Dixon, Dr. B. Luidgay Middleton, Mr. R. Clisdell, Masters C. Carne, H. Carne, G. Kopsch, K. Kopsch, and V. Windeyer.

A lecture on "Natural History Notes in New Hebrides," illustrated with lantern slides, was delivered by Mr. W. W. Froggatt, F.L.S.

The following specimens were exhibited:—Mr. A. A. Hamilton, harbarium specimens of *Scaevola sauveolens*, *Acacia trinervata*, *Pterostylus parviflora*, *Adiantum diaphanum*, *Grevillea laurifolia*, *Lissantha sapida*, illustrating range adaptation, etc., also a series typical of the flora of Helensburgh.

Notes on botanical subjects were read by Misses F. Sulman and C. le Plaistrier.

4th November, 1913. Mr. A. G. Hamilton (president) in the chair, and about 65 members and visitors were present.

The President reported that Mr. Hugh Dixon, J.P., of "Abergeldie," Summer Hill, had kindly presented the Society with a fine new electric lantern, and it was resolved that a letter of thanks for his generous gift be forwarded to Mr. Dixon. A popular lantern lecture, "The Grand Canon of Colorado and its lessons," was delivered by Mr. E. C. Andrews, B.A.

The specimens exhibited were:—Mr. A. A. Hamilton, a series of plants, with notes on taxonomy, xerophily, and distribution, also on behalf of Mr. E. H. Zeck, a leaf of a cultivated geranium showing marginal cohesion. Mr. E. Cheel, fruit of "Baobab" or "Monkey Bread" (*Adansonia*), which in Africa is used for water-bottles and floats. The pulpy endocarp has an agreeable acidity, and is eaten either raw or boiled with sugar. The Australian *A. Gregori* has fruits very similar to the African species (*A. digitata*). Rose leaves badly infested with rose-rust (*Phragmidium subcorticum*). Some peculiar little pitchers (*ascidia*) developed on *Dischidia* sp. found entwined amongst some epiphitic orchids sent from the Solomon Islands to the Botanic Gardens by Mr. D. W. Shiress.

Fresh flowering specimens of *Poranthera corymbosa* and *Cassinia denticulata* from Hill Top.

The President announced that Mr. C. J. White had very kindly offered to act as honorary lanternist to the Society, and on the recommendation of the Council it was resolved that Mr. White be elected an honorary member.

2nd December, 1913. Mr. A. G. Hamilton (president) in the chair. About 47 members and visitors were present.

Miss Preston and Mr. P. O'Hara were elected members.

Rev. W. W. Watts delivered a lecture on "A Fern Hunt in Northern Queensland." The lecture was illustrated with a large collection of mounted ferns, including several species probably new to science. Mr. Watts described the ravines and gullies in the neighbourhood of Mount Bartle Frere and other localities, and gave an interesting and instructive account of the habits and structure of ferns. A cordial vote of thanks to Mr. Watts was carried by acclamation.

The exhibits were:—Mr. E. Cheel. skin of the so-called Australian Flying Mouse or Pigmy Flying Oppossum [*Petaurus* (*Acrobata*) *pygmaeus*] killed by a cat at Hill Top, also specimens of "cuckoo" or "frog-spit" on plants; Mr. G. A. Waterhouse, a fine series of butterflies representing the sub-species of *Tisiphone abeona;* Mrs. Wyndier Edmunds, caterpillars from Hanging Rock Gravel Pits affected by the parasitic fungus *Cordyceps*, and *Potamides ebenoea* with attached oysters; Mr. E. J. Bickford, West Australian "Black Kangaroo Paw" (*Macropidia fumosa*), with a note thereon; MissG. H. Froggatt read a note on *Thynnus variabilis;* Mr. Hamilton, herbarium specimens of *Gompholobium uncinatum*, *Billardiera scandens*, *Asplenium adiantoides*, and *Grevillea phylicoides*, with notes thereon; Mr. H. E. Finckh, diamonds from an old river bed above Cope's Creek and from ironstone at Copeton diamond fields, where they are associated with quartz, tin, garnets, tourmaline, sapphires, etc.

A list of names of aquatic and semi-aquatic plants, compiled and sent from England by Miss Tobin, was laid on the table for the use of members. Several of these occur in this State, and it is intended to introduce some of the more desirable of the other species.

THE NATURALIST PAST AND PRESENT.

(Summary of Presidential Address).

By E. S. Edwards, M.A.

There is a fascination in the endeavour to discover how primitive people accounted for the phenomena of nature. How did they explain the glory of the spring, the summer heat, the falling of the leaf, and the cold hand of winter The myriads of insects around them, the birds and their migrations, the animal life in the woods, all these things must have interested them greatly. Is there any record of their impressions? In legend and folk lore, and later still in poetic fragments of writings of men of whose names even we have sometimes no record. There were conventional explanations of many of nature's phenomena, as in the case of the seasons. The story of Demeter and Persephone, for instance, popularized by the painting of Sir Frederick Leighton, tells how Persephone was spirited away to his underground world by Pluto, how Demeter, mourning for her daughter, caused the seed to lie unfertilised in the furrow, and famine and desolation to come over the land. How at last Zeus sent Hermes to bring Persephone back from the lower world and restore her to her mother. At the meeting of mother and daughter the plants burst into flower and all nature revived. A compromise was effected, and for two-thirds of the year Persephone remained with her mother, for the remaining four months she returned to the lower world. And so they accounted for the seasons and the accidents of famine and drought by the vagaries of the gods. There was a belief, current later also amongst the Greeks, that trees and flowers were the dwelling places of living spirits; they accounted for many things by the supposed transmigration of souls into mulberry and laurel, mint and hyacinth. Walter Pater points out that in one Homeric hymn it states that at the moment of birth of the nymphs, which animate the forest tree, oak tree or pine grew up, and when each nymph died the bark of the tree fell off and the branches perished.

They accounted for the foliage of the trees, the petals of the flowers, and the skins of the fruit by the spinning and weaving of the fairy fingers of the forest nymphs. Dionysius was the soul of the vine, the spirit alive, and leaping in a thousand vines, so the generation of the sweetness and strength in the veins of the vines and the transformation of all into the grape were due to him, "what is to us a secret chemistry of nature being to them the mediation of living spirits."

There are some delightful references to insects in Greek poetry, from these I have taken a few which are of especial interest to us. Here is one attributed to Meleager:—

> "O thou grasshopper that cheatest me of my regrets, the soother of slumber;—O thou grasshopper that art the muse of ploughed fields, and art with shrill wings the self-formed imitation of the lyre, chirrup me something pleasant, while beating thy vocal wings with thy feet. How I wish, O grasshopper that thou wouldst release me from the troubles of much sleepless care, weaving the thread

> of a voice that causes love to wander away! And I will give thee for morning gifts a leek ever fresh, and drops of dew, cut up small for thy mouth."

The locusts and short-horned grasshoppers (*Acridiidae*), as you know, rub with their hind legs up and down some of the projecting nervures on the sides of the closed elytra or fore-wings to produce the sounds with which we are as familiar as the Greeks.

Here is also a record which any of us would be glad to publish in our journal: A nightingale has caught a cicada which it has taken to its nest. Evenus calls the nightingale "Attic Maiden," because in Greek mythology the nightingale was a daughter of an ancient king of Attica. This is the poem:—

> "Thou, Attic maiden, honey-fed, hast chirping seized a chirping cicada, and bearest it to thy unfledged young—thou, a twitterer, the twitterer; thou, the winged, well-winged; thou, a stranger, the stranger; thou, a summer child, the summer child! Wilt thou not quickly throw it away? For it is not right, it is not just, that those engaged in song should perish by the mouths of those engaged in song!

The Greeks were well aware that only the male cicada sings, for one poet has written, "Happy are the cicadas' lives, for they all have voiceless wives." They were very interested in the cicadae, grasshoppers, and some of the night crickets. Some of the locusts they kept in cages made of plaited reeds. Lafcadio Hearn points out that the same thing is done in Tokio to-day, and that while the Greeks fed the captives on leeks, the Japanese provide theirs with a similar kind of food.

Most of the poems referring to these insects are from 2,000 to 2,500 years old.

The references to objects of natural history in Homer are mainly as similes; they are not described as a naturalist would depict them. Lions predominate in the Homeric legend, indeed Homer must have been well acquainted with them. Though they have not been known in Europe for many centuries, Herodotus mentions that they abounded on the rocky portions of Macedonia and Thessaly. They attacked the baggage animals of Xerxes' army on his march through those districts into Greece, and fell specially on the camels. The historian naively wonders at them abandoning their habits of preying on horses and oxen and attacking camels which they had never seen. Why should not a lion have a change of diet? Of insects he refers to the gadfly, which attacked the herds, and a worm or weevil which injured the wood of

Odysseus' bow. Locusts are represented fleeing from fire, and the chirping tettix or grasshopper is often referred to.

Hippocrates, B.C. 460, was perhaps the first regular writer on natural history. Aristotle, B.C. 356, wrote some treatises on the same subject. Most of these are lost, but what remain give a high idea of his sagacity. Alexander the Great, his pupil, is supposed to have sent him specimens from India. Pliny, Strabo, Rehan, Theophrastus, and others in the early part of the Christian era wrote largely on the subject, but while their works are full of interesting information, they are also crowded with errors. They exhibit on the whole great ignorance of anatomy and physiology and a habit of accepting statements on insufficient evidence. Poetry and folk lore were mixed with science. But with the rise of the Roman Empire the interest in natural history dies away. In the Æneid there is scarcely a reference to it, though the same must be said of the Hebrew record. You will search in vain through Dante's "Divine Comedy" for any interest in nature, that reflection of the mind of the Middle Ages is indeed a barren record. It was only with the return of Greek life and thought in the Renaissance that the divine curiosity in the life about them awoke again. Perhaps it came to the great painters first. A flower as a symbol of some particular saint appeared in their pictures, the beauty of the world about them asserting itself, then a background of landscape or flowing waters or rocks and trees.

The voyages of discovery, the bringing back of many strange plants and fruits were a profound stimulus to enquiry, and gradually men learnt how to systematize their knowledge. Linnaeus, 1707-1778, was the great organizer of botanic knowledge, and prepared the way for men like Charles Darwin, Wallace, and others, though he held hopelessly different views to these later investigators. He lent the weight of his authority to the doctrine of the constancy of species, which he for the first time gave precise expression to. With Charles Darwin and "The Origin of Species" we enter upon the great era of modern scientific investigation.

When we turn to our own country we seem to be met on the very threshold of its life by the enquiring face of the naturalist. When Captain Cook entered Botany Bay Charles Darwin was not born. Next to Captain Cook the most interesting of that intrepid band of navigators is Sir Joseph Banks; he is, of course, a familiar figure, familiar to us and familiar to the world of scientists and explorers, one, indeed, of the most fascinating personalities in the history of that wonderful century of daring and exploration. Dignified, with great ability and high connections, wealthy and generous, his whole life given to the cause he loved, he visited us for a brief occasion and took infinite interest ever afterwards in our life and resources. But yet with all his great gifts and profound knowledge he is hardly quite as interesting to us as one who possessed neither his great gifts nor his magnificent opportunities. Daniel Southwell was one of ourselves, and when I say that I mean that he was an amateur naturalist, corresponding to so many of our own members. He was a mate in H.M.S. Sirius with the First Fleet, and recorded his impressions in a diary and letters, which are carefully preserved in the British Museum. He entered the Sirius as a midshipman, but was appointed to a mate's position when Mr. Sealey remained at Rio Janeiro, and much to his disappointment was given charge of the Look-out Station at South Head when the First Fleet moved into Port Jackson. He was assured afterwards by Captain Phillip that it was given him as a compliment, and appears to have been gratified by the fact. On the great southern sentinel of our port always stands, in my imagination, the lonely watcher, the first in all our history, around him and above the gathered beauty of the sea and stars, and falling from his feet in many curving lines of gracious beauty the splendour of our harbour in its primeval glory. He seems so typical of intelligent youth, standing there with parted lips and wide open eyes gazing into the wonders about him. How interested he was on the life of the bush and all its variety, and how intelligently he speaks of it all is evidenced in his journal. Of the harbour he says, "Nothing can be conceived more picturesque than the appearance of the country while running up this extraordinary harbour." His description of the quadrupeds is specially interesting. "Most quads of the place are handy with their paws, and, though not to be pronounced of the monkey kind, are monkeyish in their manners, and were it not that we meet with no regular gent of that class should suspect that there was a distinct gradation as links in the chain which naturalists affirm is insensibly continued from one order to another." Remember that this was in the year 1788, the parts of the journal from which I quote are from the 20th January to 29th May, 1788. Charles Darwin was not born till 10 years after that date Here Southwell enunciates a principle of development. He has been thinking and reading, too, for he was manifestly well acquainted with the advanced scientific thought of his day. Darwin, who was to bring to a head these theories wandering in the minds of men, was not yet born; Linnaeus was not long dead, and Gilbert White, author of "The Natural History of Selborne," was still alive. The first collection of aboriginal words appears in his journal, and his descriptions of fish, insects, and plants are evidence of close observation, of varied knowledge, and wide experience for so young a man.

John White, who left England 5th March, 1787, and was Surgeon-General to the Settlement, 1788, is another interesting amateur naturalist of our very early history. His experiences are given in "A Voyage to Botany Bay, 1787-8-9." He was particularly interested in our birds, and his descriptions of them are full and the work of a keen observer.

It would be impossible to refer to many well-known names who were professional naturalists and occupied their lives in collecting and naming our flora and fauna.

Govett, the surveyor, gives in his journal some interesting sketches of birds, men, and animals, and records some unusual incidents in his experience. The Leap at Blackheath was discovered by him and named in honour of this interesting personality.

Our history has been contemporaneous with much bitter strife, resulting in ultimate victory for the principles of variation, heredity, and evolution. These have been battle cries for fifty years. A great impetus to morphology and anatomy was given by Darwin's "Origin of Species," and investigations by naturalists have been made more from the desire to render further aid to the proofs of these theories than from a positive love of nature. But of these things men are getting somewhat weary, and the love of nature for her own sake is strongly reasserting itself. The study of Functions which Kreidl began so far back as 1893, is receiving more and more the attention it deserves, and the naturalist is becoming more an observer of the living form than the collector of dead specimens.

There is a strong reaction amongst naturalists, especially in America and France against the vagueness and inaccuracy of the so-called literary and anecdotal naturalist. The anthropomorphic tendency has been very misleading and unscientific. Professor Washburn deals with it in this way. Take the case of the angry wasp. Anger in our consciousness is composed of, or as some prefer to say, is accompanied by sensations of a quickened heart beat, altered breathing, a change in muscular tension, and so on. But the circulation of the "blood" so-called (a sort of refined Chyle) in the wasp is fundamentally different from that of vertebrates. The wasp, too, has no lungs, but breathes through trachae, while its muscles are attached internally, because its skeleton is everywhere external. What then must anger be like in a wasp's consciousness, if it has one? If we are wise we shall sweep away our anthropomorphic language in reference to insects and animals and adopt another attitude of mind towards the lives we observe.

Some of the more modern advanced papers which have been published will give an idea of the direction in which these naturalists are working. The following will illustrate: "The life and behaviour of the Cuckoo," "The role of vision in the mental life of the mouse," and "The sense of hearing in Frogs."

(The lecturer gave interesting excerpts from the works of the Peckhams and others, illustrating advanced field naturalist work). Our work lies in the life of the world about us, and guided by the scientific training of these modern days into accuracy of observation, and aided by love of the natural world, much can be done by the humblest worker. To the student of nature there is one certainty that however great the work and however difficult it may prove, "nature never did betray the heart that loved her."

OBSERVATIONS ON LEPIDOPTERA.

By C. H. Wickham.

Chelepteryx Collesi. The caterpillar feeds on eucalyptus leaves at night, resting by day on the bark where it is inconspicuous. They sometimes grow to a length of six inches. The irritating brown hairs are readily shed, and constitute an effective defence against molestation. When pupating the caterpillar presses its back against the silky cocoon, causing the hairs to protrude right through, in which position they remain when the caterpillar withdraws its back. The sides are then treated in the same way. The cocoon is thus thoroughly protected. The larvae are found from November to January, and the pupal state lasts for 150 to 160 days.

Aciptilia aptalis. The larvae of this little moth is only half an inch in length, pale green, and covered with fine white hairs. They somewhat resemble Lycenid butterfly larvae in appearance and habits. The food plant is *Astrotricha floccosa* the leaf surfaces being eaten. The larvae pupate without spinning a cocoon, attaching themselves by the tail and lying close to the surface of the leaves. In this they resemble butterflies, but differ in having the legs free and in having the power of slightly rising when touched. The larvae are found in January and February, and the pupal state lasts for only 8 days.

Papilio aegeus. In January last I took two larvae of this common citrus feeding butterfly. One was nearly full grown, and was given plenty of food, and pupated January 31st. The other was only half grown, and through my being unable to secure sufficient food for it, grew very little more before pupating on February 23rd; it hatched out in 20 days, while the well fed individual completed its metamorphosis in 294 days.

I am inclined to think that the poorly developed one, not having sufficient stamina to stand a prolonged hibernation, accordingly hatched out quickly, nature providing for such cases in quick metamorphosis of the tissues.

Porthesia holdluca. Pupae are usually very delicate organisms, and a slight injury is sufficient to destroy them. I had an interesting exception to this rule. I put a pupa of the above Liparid moth in the cyanide bottle for half an hour and then pinned it in the insect case. Three days later I was surprised to see a moth on the pin and the empty pupa case at the bottom of the box.

BIRD NOTES.

BY DAVID G. STEAD, F.L.S.

1. BIRDS OBSERVED BETWEEN JENOLAN AND TITANIA, 9 AND 10/3/1912.

The undermentioned birds were observed by me on the dates mentioned, while I was on a journey by road from Jenolan Caves to Titania (Duckmaloi River) via Oberon. It is of interest to compare the list with those—mentioned later—seen during June, of the same year, while travelling over the same course.

Australian Coot ("Dabchick"), *Fulica australis* (Duckmaloi River).

Southern Stone-Curlew, *Burhinus grallarius.*

Spurwing Plover, *Lobivanellis lobatus.*

White-fronted Heron ("Blue Crane"), *Notophoyx novaehollandiae.*

Whistling Eagle ("Kite"), *Haliastur sphenurus.**

Nankeen Kestrel, *Cerchneis cenchroides.*

Gang Gang Cockatoo, *Callocephalum galeatum.*

Crimson Parrot, *Platycercus elegans.**

Rosella, *Platycercus eximius.* *

Laughing Jackass, *Dacelo gigas.*

Rainbow Bird, *Merops ornatus.*

Spinetail Swift, *Chatura caudacuta.*

Pallid Cuckoo, *Cuculus inornatus.**

Welcome Swallow, *Chelidon neoxena.*

Scarlet-breasted Robin, *Petroica leggei.**

Willy Wagtail (Black and White Fantail), *Rhipidura motacilloides.*

Black-faced Cuckoo-Shrike ("Blue Jay"), *Coracina robusta.**

Little Tit Warbler, *Acanthiza nana.*

Yellow-rumped Tit (Yellow-tailed Tit Warbler), *Acanthiza chryssorrhoa.*

Rock Warbler (Rock Robin), *Origma rubricata.* At Jenolan Caves only.

Superb Warbler ("Blue Wren"), *Malurus cyanochlamys.*
Dusky Wood Swallow, *Artamus tenebrosus.*
Magpie Lark ("Peewee"), *Grallina picata.*
Harmonious Thrush, *Colluricincla harmonica.**
Black-backed Magpie, *Gymnorhina tibicen.*
Australian Butcher Bird, *Cracticus destructor.*
"Silver Eye," *Zosterops coerulescens.*
Spinebill, *Acanthorhynchus tenuirostris.*
Singing Honey-eater, *Ptilotis sonora.*
Soldier Bird (Noisy Miner), *Myzantha garrula.**
Friar Bird ("Leatherhead"), *Tropidorhynchus corniculatus.**
Australian Pipit ("Ground Lark"), *Anthus australis.*
Redhead (Red-browned Finch), *Ægintha temporalis.*
Australian Raven ("Crow"), *Corvus marianæ.**
Pied Bell-Magpie, *Strepera graculina.**
Grey Bell-Magpie, *Strepera versicolor.**

2. BIRDS OBSERVED BETWEEN JENOLAN AND TITANIA AND BACK TO JENOLAN, 18–21/6/1912.

Black Duck, *Anas superciliosa* (on Duckmaloi River).
Whistling Eagle (Kite), *Haliastur sphenurus.*
Wedge-tailed Eagle, *Uroaetus audax.*
Crimson Parrot, *Platycercus elegans.*†
Rosela, *Platycercus eximius*†
Narrow-billed Bronze Cuckoo, *Chalcococcyx basilis* sp? (At Jenolan Caves).
Scarlet-Breasted Robin, *Petroica legei.*
Flame-Breasted Robin, *Petroica phœnicea.*†
Spotted Ground Bird, *Cinclosoma punctatum.*
Striated Tit warbler, *Acanthiza lineata.*†
Yellow-Rumped Tit (Yellow-tailed Tit Warbler), *Acanthiza chryssorrhoa.**†
Rock Warbler (Rock Robin), *Origma rubricata.* (At Jenolan Caves).
White-browed Scrub Wren, *Sericornis frontalis.*
Superb Warbler ("Blue Wren"), *Malurus cyanochlamys.*
Harmonious Thrush, *Colluricincla harmonica.*†
Black-backed Magpie, *Gymnorhina tibicen.**†
Australian "Butcher Bird," *Cracticus destructor.*
Brown Tree Creeper, *Climacteris picumna.*
Tree Creeper, sp?*
Soldier Bird (Noisy Miner), *Myzantha garrula.*†
Australian Raven ("Crow"), *Corvus marianæ.*
White-winged Chough, *Corcorax melanorhamphus.**†
Pied Bell Magpie, *Strepera graculina.**†
Grey Bell Magpie, *Strepera versicolor.**†

In each group, those indicated by an asterisk were seen between Jenolan (about half way up "Caves Hill") and Oberon—in the first case on a mild afternoon in March; in the second on a bitingly cold afternoon in June. This forms an interesting comparison. In the second instance only six species were seen, yet, returning over the same road three days afterwards (21/6/12), I was able to record those marked with a "†." On the latter date the journey was made during the morning, when—although the ground was frozen—there was no bleak wind such as had been experienced three days before.

EXCURSIONS.

Glenbrook Creek, October 11th.—The more notable of the plants collected were:—*Boronia Fraseri*, known only from Nepean district, *Prostanthera incisa*, *Phebalium Billiardieri*, *Pittosporum revolutum*, *Xanthosia vestita*, *Diuris aurea*, *Dendrobium aemulum*. F. SULMAN.

Maroubra, November 8th.—The following plants were noticed:—

In Flower.

Ceratopetalum gummiferum
Actinotus helianthi
Xanthosia pilosa
Dianella coerulea
,, longifolia
Hibbertia stricta
,, fas-cicularis
Diosera binata
Banksia serrata
Poranthera corymbosa
Kunzia corifolia
Darwinia fascicularis
Goodenia bellidifolia

In Fruit.

Xerotes longifolia
Pomax umbellata
Orthoceras strictum
Astroloma pinifolium
Styphelia viridis
Dianella longifolia
Xanthorrhoea arborea
Gnaphalium japonicum
,, purpureum
Lysinema pungens

C. M. LE PLAISTRIER.

NOTES AND COMMENTS.

Stachys arvensis.—A note on this common British annual weed, the Corn Woundwort or Hedge Nettle, by Mr. J. Lakeman, Brownlow Hill, was read at the meeting on 7th October by Miss C. le Plaistrier. Some years ago the Rev. T. V. Alkin, then of Campbelltown, when visiting the Rectory Camden, pointed out this plant as dangerous to stock. Since then I have naturally watched it, but have never seen it do any harm. A few weeks ago I observed a herd of 60 milch cows turned into a paddock in which it was growing in profusion, without any ill effects to the cattle. Possibly, like sorghum, it may have a poisonous stage, but so far I have seen no evidence of such.

Macropidia fumosa, "Black Kangaroo Paw," Nat. Order Haemodoraceae. This genus is limited to a single species endemic to West Australia. It has been reunited to Anigozanthos by the late Baron von Mueller, notwithstanding the remarkable difference in both ovary and fruit. It is a remarkable flower and well worth cultivating. I have seedlings received from Greenough Flats, W.A. E. J. BICKFORD.

Thynnus variabilis.—Very little is known about the life-history of these curious flower wasps. The wingless females have short stout legs adapted for digging. Like the Scolid wasps, they apparently burrow into the loose soil and deposit their eggs upon the grubs of the large brown cockchafer beetles. The cocoon of *Thynnus* differs from that of the Scolüdae in having a rounded nipple at one end. Australia is the home of these handsome flower wasps. The specimens exhibited were hatched from cocoons obtained when digging in our garden at Croydon. GLADYS H. FROGGATT.

SENSE OF SMELL IN FISHES.—A very important paper by G. A. Parker and R. E. Sheldon, bearing upon this much-debated subject, has come to hand. It forms Document No. 775 of the Bulletin of the U.S.A. Bureau of Fisheries. Summarised, the authors' investigations show that:—

"(1) A current of water passes through the nasal chambers of many fishes in a direction from anterior to posterior. It may be produced by ciliary action (*Ameiurus*), by pressure due to the action of the respiratory muscles (*Fundulus*), or it may be a part of the true respiratory current (*Mustelus*).

"(2) By means of this current, dissolved substances in the water are brought into contact with the olfactory surfaces."

"(3) Fishes distinguish packets containing hidden food from similar packets without food."

"(4) The power of distinguishing the two classes of packets is lost when the olfactory tracts are cut, when the anterior olfactory apertures are stitched up or when the apertures are plugged with cotton wool. It is revived on reopening the apertures by taking out the stitches or removing the cotton wool."

"(5) *Mustelus* and *Ameiurus* discover their food chiefly through the olfactory organs for this purpose."

"(6) *Mustelus*, *Fundulus*, and *Ameiurus* use the olfactory organs to scent food much as land animals do · these organs are true organs of smell, i.e., distance receptors for the chemical sense."

Among Australian fishes, I might add, the manner in which the bait is taken, say, by a Bream (*Chrysophrys*), leads one to supose that the sense of smell is almost constantly made use of; whereas in the case of the Kingfish (*Seriola*), a rush is generally made at whatever is made to *look* attractive. The latter method is largely the case in all our game fishes, in fact, and implies that sight only is used under such circumstances. Yet cases are frequently to be seen in which apparently the sense of smell has been also used.—David G. Stead.

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The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

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Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

NOTICES.

MEETING, MAY 5th—

The Origin of Australian Animals.—C. Hedley, F.L.S.

Easter Excursion, April 9th—

Special Notice sent to Members.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

February 3rd, 1914.—Mr. A. G. Hamilton (President) in the chair. The following were elected members:—Misses Green and Winn, Mr. and Mrs. C. M. Parkes, Mr. W. J. Enright, B.A.

A lecture on "Sea Birds of Furneaux and other Islands" was delivered by Mr. W. Finigan, Honorary Secretary of The Gould League of Bird Lovers of New South Wales. The slides shown by Mr. Finigan were most beautiful, and the lecture extremely interesting. The lecturer stated that a large trade was done in Mutton Bird eggs, one pastrycook in Victoria using probably over a thousand dozen in a year, as a substitute for duck eggs. The birds are found in large numbers on the islands of Port Phillip and round Cape Wollami.

The following specimens were exhibited:—Mr. D. G. Stead, F.L.S., teeth of man-eating shark, *Carcharias brachyurus,* with notes; Mr. Searle, a cast snakeskin; Mr. A. A. Hamilton, herbarium specimens of *Leucopogon amplexicaulis, Acacia pumila, Styphelia triflora, Grevillea sphacelata,* with notes thereon. On behalf of Mrs. Gibbes, of Ashfield, Mr. Carne exhibited West Australian plants grown locally.

March 3rd, 1914.—Mr. E. S. Edwards, M.A. (Vice-President), in the chair. An apology was received from the President (Mr. A. G. Hamilton), who was unable to be present. Dr. A. J. Turner and Mr. F. S. Oliver were elected members.

A letter was read from the Secretary of State for the Colonies to the Federal Prime Minister, explaining that the Importation of Plumage (Prohibition) Bill was again to be brought before the British Parliament by His Majesty's Government during the current Session.

A lecture was delivered by G. P. Darnell-Smith, B.Sc., F.I.C., on "Nature and the Mechanistic Conception of Life."

Miss Mabel Brewster exhibited specimens showing the life history of the Ant-lion (Myrmeleonides); Mr. W. M. Carne, Samoan girls' dancing skirt; jam made from fruits of Native Lime (*Atalantia glauca*); examples of lateral foliar proliferation of the inflorescence in Asters and in *Chlorophytum elatum* var *variegatum*; Mr. A. A. Hamilton, a series of herbarium specimens, with notes thereon; Mr. T. Steel, coccid and gall, *Apionorpha* (*Brachyscelis*) *variabilis,* from Beecroft, also apples eaten by ant *Iridomyrmex detectus*), the fleshy mesocarp, seeds, vascular system, and all soft parts having been neatly scooped out, leaving only the tough endocarp and the thin outer rind, the latter being like a light hollow ball, which was rolled over the surface of the soil by the wind.

NOTES ON THE HABITS OF *TEARA CONTRARIA.*

By C. H. Wickham.

The larvae live in communities of 300 or more in a web at the base of the food-plant (*Acacia longifolia*). They rest by day, climbing up at night to feed. When the tree is denuded of leaves, the colony starts out for another tree. Forming a single line, they proceed on their way, each caterpillar keeping in exact touch with that in front. While on the march, if one is removed from anywhere in the line, the remainder stop, and the one immediately in front of the vacant space begins feeling about with its tail for the displaced comrade. It will stretch itself to the utmost in so doing, but is careful not to lose touch of the individual in front. Meanwhile, the displaced caterpillar endeavours to find its lost position, and, if not moved more than a few inches, will quickly do so. But if it be taken away altogether, the individual to the rear of the gap will close up, those behind it keeping place, and as soon as it touches the one in front, a signal seems to pass almost instantaneously to the leader, who immediately starts to march again. I had some 40 of these interesting caterpillars in a glass tank, and one afternoon they started a march. They proceeded in a very orderly manner, there being no struggling for precedence, and, as is usually the case, a rather large individual acted as leader, while on this occasion the rear was brought up by a small, weakly one. During the afternoon, they got into a circle, and in this form, travelled round and round for 4½ hours. One of the larger individuals (not the leader) then broke away, and doubling on his tracks, went down the line until he had passed about six of his fellows. The whole line then stopped for a few seconds, and then began waving their heads quickly in jerks from side to side. After this, the column broke, and made its way without order in two and threes, or singly, to a corner where they formed a heap and camped all night.

When on the march, all follow the leader, even to climbing obstacles which, by a very slight divergence, could be avoided. They leave a web trail on the ground over which they pass. It is a matter to wonder over how the leader knows he is first, and the last that he is the end, for the leader does not wait for another to precede him, and the last does not seem to require the stimulus of a follower.

These hairy caterpillars demonstrate very well the phenomenon that moulting larvae shed the skin of the hairs as well as that of the body. Another unique habit of this species is that, in May, they burrow beneath the soil and hibernate without pupating till August, when they wake up and proceed at once to spin a web cocoon, into which are incorporated the hairs of their bodies, and soil. They hatch in October.

MISCELLANEOUS BOTANICAL NOTES, AUGUST, 1913.

By A. A. Hamilton.

Jacksonia scoparia, R.Br.—An ornamental shrub, with a wealth of golden Pea-blossoms on pendulus branchlets, the leaves usually reduced to minute distant scales, though occasionally developed, especially in the juvenile stages of growth. When not in flower or fruit, it might easily be mistaken for the local swamp-growing *Viminaria denudata,* another apparently leafless subject, though in this case the leaves are represented by long, slender petioles (as in some of our teretely phylloded Acacias), a demonstration of which is afforded after a bush fire has run through a patch of these plants, the young growth being plentifully furnished with true leaves, which degenerate as the plant ages. The short, black, turgid pod of *Viminaria,* however, effectually differentiates this species from *Jacksonia,* with its silky-villous, elongated fruits, which are effective in maintaining the attractiveness of the plant long after the flowers have fallen. A fine stretch of this species (*J. scoparia*) may be seen creeping up the "Lapstone" from Emu Plains on either side of the railway line. The writer, when on a botanical expedition from Barber's Creek to Nowra, via the Kangaroo Valley, in 1899, has a recollection of a group, individual specimens of which reached a height of 15 to 18 feet (it does not usually attain a height of more than 7 or 8 feet), which he saw at the top of Tallong Waterfall. In common with many of our "Wattles," it is specially subject to the depredations of "Borers." Another character which it has in common with the "Wattle" is the exudation of gum, which flows copiously if the plant is wounded. The seeds germinate freely if sown while fresh, but the seedlings are somewhat delicate, and require a little extra nursing in the adolescent stage. Mature plants are hardy in the Port Jackson district.

Ophioglossum vulgatum, Bauhin. "Adder's Tongue."—A somewhat ambiguous fern, with very dissimilar fertile and barren fronds. The former has a resemblance to the flowering spike of a sedge, though an examination of the sporangia on the top of the spike would soon make that delusion untenable. The latter has the appearance of the phanerogamic leaf of a monocotyledon, but its reticulate venation, as opposed to the parallel veining of a "Monocot," or the forked or anastomosing veins of most ferns, is characteristic of a dicotyledonus leaf. It is a cosmopolitan fern, found in most temperate countries, including Britain, where it is well known to naturalists. The specimens exhibited were collected at Lilyvale (Illawarra) about fifteen years ago, when one could find some seventeen species of ferns within a radius of fifty yards of the railway station. This rich gully is now practically dominated by the all-conquering "Blackberry."

Acianthus caudatus, R.Br. "Spider Orchid."—Fitzgerald, in his "Australian Orchids," says, this species, when it grows near the coast, is found in damp fissures of the rocks. The writer's experience is somewhat different, he having found it in two places in the Port Jackson district, viz., Lane Cove and Cooks River, and on each occasion, it was growing on flat land some distance from the rocks. In the latter place, it was found in stiff, clayey soil on the plateau lying between Cooks River and Wollii Creek, in the shade of a patch of "Tea-tree" *Melaleuca nodosa,* a shrub for whose ægis many of our terrestrial orchids exhibit a pronounced partiality. In Tasmania, according to Hooker, it grows in moist, shady woods.

Helichrysum leucopsidium, D.C.—Along the branch line which runs from Newnes Junction into the Wolgan Valley, what appeared to be two distinct forms of this showy white "Everlasting" were noticed. One, an open spreading shrubby plant, about two feet high, the leaves comparatively distant; the other, a low plant not exceeding six inches, with densely packed leaves. A closer examination disclosed the short clumpy growth as a patch of plants, while its more robust neighbour was an individual specimen. In the former case, the competition for a food supply had evidently brought about the usual result—a weak growth—which generally takes the form of spindly plants with sparse stem foliage. In this case, the plants, instead of becoming "Leggy," had spread laterally, "Stooling" like a carnation, and exhibiting a stunted growth, with consequent crowding of the leaves. No doubt this is owing to the rigorous climate, as Newnes Junction is about the highest point on the Western line, some 3500 feet above sea level. This species grows almost as freely from seeds as its well-known relative, *H. bracteatum,* the deservedly popular garden "Everlasting," which is also an "Australian Native." It has proved satisfactory in the neighbourhood of Sydney.

Grevillea asplenifolia, R.Br.—This plant is often found growing with its feet in running water, and in such a position—in the shady gullies of the Blue Mountains—its highest development is attained. Its range extends, via the Nepean and George's Rivers, through the National Park, southwards. It is a shapely, quick-growing shrub with elongated, deeply incised foliage, silvery white on the underside, and numerous lengthy racemes of flowers, which have a peculiar appearance owing to the protrusion of the bent style from the corolla, previous to its release by the unilateral revolution of the corolla lobes, a character possessed by other Proteaceous plants, notably Banksias. Under cultivation, it is apt to grow somewhat straggly, and occasionally throw out a "Rampant" branch. For those prim, formal gardeners to whom this is an offence, some consolation may be found in the fact that this plant will tolerate a very severe operation performed with a pair of pruning seccateurs. Though a moisture-loving plant, it readily adapts itself to a dry situation, and is one of the easiest cultivated of our native plants. The specimens shown are from "Sassafras Gully," Springwood.

Stackhousia spathulata, Sieb. Cronulla Beach.—This species may be easily separated from other New South Wales members of the genus, by the dorsal membranous angles of the carpels, a character not possessed by its fellows. It is found on ocean beaches, and has a range from South Australia to Queensland. At Port Macquarie, it is known as the "Beach Forget-Me-Not," in reference, no doubt, to a superficial resemblance of the inflorescence, and perhaps a similarity in the perfume to those of the "Old Country" favourite. It is a low, tufted, herbaceous plant, very suitable for edging, and its fragrant cream-coloured flower spikes should gain it a high measure of popularity for this purpose. The writer has not cultivated this species, but would recommend a trial in sandy, coastal gardens, preferably with seeds, which are obtainable about the end of November.

INSECTS ASSOCIATED WITH ANGOPHORA CORDIFOLIA.

The following list of insects collected during December, 1912, on *angophora cordifolia,* at Como, and exhibited by Mr. Froggatt at the meeting of the Society in April following, illustrates well what a wealth of insect life is supported by this plant. It should be mentioned that this list is by no means complete, a large number of undetermined insects being also observed:—

COLEOPTERA.

BUPRESTIDAE.

Stigmodera macularia
,, variabilis
,, vertebralis
,, cruenta
,, Andersoni
,, undulata
,, indistincta
,, Kerreemansi
,, bella
,, crenata
,, spilota
,, octospilota
Curis chalcoptera
Cisseis duodecem-maculata

S. vicina
,, bicincta
,, brutilla
,, klugii
,, cyanicollis
,, australasiae
,, amplipennis
,, rufipennis
,, spinolae
,, amphichroa
,, semicincta
C. aurifera
Cyria imperalis

SCARABAEIDAE.

Eupoeala Australasiae
Polystigma punctata
Micropoecila cincta
Cacochroa variabilis

C. gymnopleura
Glycyphana brunnipes
Diaphonia dorsalis

CERAMBYCIDAE.

Phoracantha recurva
Tragocera Spencei
fasciata
Aridaeus thoracica
Uracanthus triangularis
Hesthesis ferruginea
cingulata
murina
vigilans
Trichomesia Newmani

CURCULIONIDAE.

Oxyops cancellata
Rhinotea sp.

CLERIDAE.

Zenithicola australis
obesus
Eleale sp.
Aulicus instabilis

ELATERIDAE.

Anilicus semiflavus.

CISTELIDAE.

Atractus viridis.

MORDELLIDAE.

Mordella leucosticta.

DIPTERA.

DEXIIDAE.

Rutilia decora
inornata
formosa
Amphibolia fulvipes
Amenia leonina

MUSCIDAE.

Lucilia sericata.

SYRPHIDAE.

Helophilus griseus.

STRATIOMYIDAE.

Odontomyia stylata.

ASILIDAE.

Asilius sp.
Dasypogon sp.
Laphria diversipes

APIOCERIDAE.

Apiocera spp. (tuco).

SARCOPHAGIDAE.

Sarcophaga aurifrous.

TABANIDAE.

Tabanus brevidentatus
Pangonia auriflua

BOMBYLIIDAE.

Hyperalonia albiventris.

HYMENOPTERA.

SPHEGIDAE.

Exeirus lateritius
Sphex modesta
S. sp.
Aporus sp.

POMPILIDAE.

Priocnemus australis
,, sp.
Pompilus sp.

THYNNIDAE.

Thynnus variabilis
flavibabrus
Agriomyia marginilabris
Thynnoides fumipennis
Æbothynnus umbripennis
sanguinolentus
Epactiothynnus tasmaniensis
Asthenothynnus beatrix

SCOLIIDAE.

Dielis 7-cincta.

VESPIDAE

Polistes tasmaniensis.

ICHNENMONIDAE.

Ecthromorpha intricatoria.

APIDAE.

Paracolletes crassipes
Melbournenis
Prosopis anchorata
alcyonea
despons
Pachyprosopis humeralis
flavicaudata
angophorae
Euryglossa mutica
leptospermi
aurantifera
Lestes auratus
Megachile cetera
Exoneura concinnula
Sericophorus viridis

EVANIDAE.

Evania sp.

LIFE HISTORY OF MOSQUITO.

By Mabel N. Brewster.

On February 20th of this year I watched the mosquito laying its eggs on water, the method of forming the egg-raft being most interesting. In two days the eggs hatched and eight of the tiny larvae were placed in separate small bottles of water, the bottles being gummed to pieces of glass to prevent overturning. From time of hatching to first moult varied from three to five days, between first and second moults in each case was two days, and from second to third moult varied from three to five days, after which pupation took place. The adults hatched out two days after pupation.

The average life history from egg to adult is thus seen to be about a fortnight. A previous batch, when the weather was cooler, took a month to complete the life cycle.

It was most interesting to see the issuing of the adult mosquito from the pupal shell. The pupa first stretched the abdominal end, then the shell of the thorax cracked, the head and thorax showing through. The insect then rested for a time, after which the head and thorax were extruded, the abdomen meanwhile working with a bellows action. It then drew itself clear of the shell, and again rested before flying away.

NOTES ON ANT-LION (MYRMELEONIDES).

By Mabel N. Brewster.

The larvae were found at Long Bay in November. They were placed in a box of sand, covered with a glass lid, and well supplied with ants, which were attracted by placing sugar on the glass lid. Their food consisted of ants, though on occasion I noticed the skins of flies and of caterpillars. The pupal state was assumed in just over two months, the pupa being a beautiful round object about the size of a small marble, made from gummy silk, secreted by the abdomen, and covered with sand. On February 21st, the insect hatched, a little round lid opening at one end of the pupal case, and the head of the insect appearing. It then drew itself right up, enclosed in the pupal skin, which was slit from the head down the back. The insect gradually drew itself clear, and proceeded to blow out its wings. Although I have previously reared ant-lions, I have not before witnessed the actual emergence.

EXCURSION TO COOKS RIVER.

Notwithstanding the threatening aspect of the weather and that we are in the midst of Nature's resting season, there was a fair attendance of members. In a short trip, which occupied something less than two hours, the following interesting plants were noted:—Four Melaleucas, including the rare M. Deanei; Cassinia longifolia and C. aculeata (the latter in flower); Hibbertia serpyllifolia; Acacia pumila; A. hispidula (in early flower); Vellya lyrata; Myrsine variabilis; Daviesia acicularis; Baeckea densifolia (with a few belated blossoms; Melichrus rotatus; Persoonia hirsuta; Mimulus ripens; Triglochin striata; Scirpus littoralis; Panicum indicum, etc.

—A. A. Hamilton.

NOTES AND COMMENTS.

A Field Naturalist of 50 Years' Standing.—On January 12th, at Beverley, West Australia, F. H. du Bouley, who has been a well-known collector of Natural History for 50 years, died after his last beetle hunt, from heart failure.

Mr. du Bouley was born at Sandgate, Kent, on January 29th, 1837, and was one of our very first bush naturalists, being an ardent beetle hunter from the time he settled in Champion Bay (Geraldton), West Australia, in 1857, up to the day of his death.

Engaged in squatting life, he did some pioneer work to the north as far as Roebuck Bay, and went to Port Hedland with Captain Hedland, after whom the port was named. He collected insects around Sharks Bay, Kings Sound, and other localities then unknown.

At that distant date little was known of the smaller things of our fauna, and he obtained many new and rare species. Getting into communication with the authorities of the British Museum, he became well-known among field naturalists. In a journey overland from Perth to Albany, in 1866, he met Mr. George Masters collecting for the Australian Museum, and which further interested him in the work of insect collecting.

Later he paid a visit to New South Wales, and when Cooktown Gold Rush broke out in North Queensland, his love of wandering and adventure took him there. He did not strike it rich, however, and returning, finally made his home in Beechworth, Victoria, where he resided for a number of years.

Once again the call of the West came to him with the gold fields at Coolgardie, and about 1902 he returned to Western Australia, and again took up his hobby of beetle collecting, remaining there until his death.

Du Bouley made many fine collections of beetles and other insects, and at one time had one of the finest collections of Buprestidae and Cetonidae in Australia; and also a magnificent collection of Carenums and other Carabidae. He has left his name upon the record of our insect fauna by the many species, both rare and beautiful, that have been dedicated to him, and among which are the following:—

Stigmodera dubouleyi
Articeros ,,
Saragus ,,
Saragodinus ,,
Amarygmimus ,,
Leptops ,,
Homaemota ,,
Ditropidus ,,
Dibolia ,,
Chlamydopsis ,,

and the Chrysomelid Genus *Dubulaia*.

—Walter W. Froggatt.

Man-Eating Sharks.—Mr. David G. Stead exhibited teeth of a great "Man-Eater," or Whaler, Shark (*Carcharias brachyurus*), which had been captured in Coomba Bay, far up in the quiet, shallow waters of Wallis Lake. Two of these great and fearsome fish, measuring respectively 9ft. and 10ft. in length (and of great girth), were taken at the same time in hauling nets; and at this place, on the 20th December last, 9 fully developed fœtuses, measuring about 28½ inches in length (the size of an average one measured) were taken from each fish.

As stated by him elsewhere, at various times, this shark is the one most to be feared in our waters, and the capture of these two large females, so far up the almost enclosed waters of this great shallow, coastal lake, still further emphasises the warning given by him, from time to time, regarding the species.

The young are very savage when handled, and even the mature fœtus, when cut out of the parent, will frequently snap at the hand of the person holding it.

NATIVE LIME JAM.—At the March meeting, Mr. W. M. Carne exhibited a sample of jam made from the fruits of the Native Lime (*Atalantia glauca*), on behalf of Mr. F. S. Carne, of Roma, Queensland, and read the following note:—"The limes flower in early spring, and the fruit is ripe in November. The trees appear to be about five years old when they commence bearing, and are then 10 to 12 feet high. At certain periods of the year the trees exude a quantity of a slightly tart-tasting gum, which is eaten by some people. Besides being made into jam, the fruits are pickled, and also used for making drinks."

It is interesting to note that the United States Department of Agriculture is experimenting with this plant. It is hoped by crossing with the orange, to produce a drought-resisting citrus fruit.

LATERAL FOLIAR PROLIFERATION.—In the specimens of Asters exhibited, the leafy shoots have been developed within the bract involucres. In the case of *Chlorophytum elatum* var *variegatum,* several stages may be noted:—

1. Normal flowers.
2. Leafy shoots, with terminal flowers.
3. Leafy shoots, with lateral flowers at the base, or without flowers.

The leafy shoots are viviparous, bulbil-like plants, which are already sending out roots. The conditions which have caused this abnormal development, have converted the sexual into asexual reproduction.

—W. M. CARNE.

FRUIT-LIKE GALL ON EUCALYPT.—The insect producing this gall is *Apiomorpha variabilis.* It is a fleshy, pyramid-shaped inert creature, with short abortive legs and antennae. The female never leaves the gall. The male is a minute winged insect, which, though abundant enough when hatched, is seldom seen. The eggs hatch in the body of the mother, and the young swarm out by the apical pore of the gall, and attach themselves to the surrounding twigs. The gall bears a remarkable resemblance to a hard, woody fig.

—THOS. STEEL.

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The Naturalists' Society
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The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

NOTICES.

MEETING, JULY 7th, at 8 p.m.—

Lecture: "The Spider—Builder, Engineer and Aviator."

By W. J. RAINBOW, Esq., F.L.S., F.E.S.

ANNUAL MEETING, AUGUST 4th, at 8 p.m.

Presidential Address by the President,

A. G. HAMILTON, Esq.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE
Australian Naturalist.

Vol. III. JULY 7, 1914. Part 3.

NOTE.—Members having any matter of interest suitable for pnblication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

April 7th, 1914.—Mr. A. G. Hamilton (President) in the chair. The following were elected members:—Miss J. C. Wilson, Messrs. L. Gallard, and E. Stratton. A most luminous and interesting lecture on "Bacteriology," with lantern illustrations, was delivered by Professor D. A. Welsh, M.D.

The lecturer handled his subject in a most attractive manner, and in simple language imparted a great deal of valuable information. The following specimens were exhibited:—Miss Sulman, fresh flowering specimens of *Cryptandra ericifolia* and *Baeckia densifolia;* Miss Le Plaistrier, fungi, including a fine series of *Psalliota arvensis* (?), having a strong iodoform-like odour, and of the so-called slime fungi (Mycetozoa); Mr. W. M. Carne, fruits of Native Lime, *Atalantia glauca,* second crop, from Roma, Queensland; Mr. A. A. Hamilton, rare plants, *Melaleuca Deanei* and *Acacia asparagoides,* also a "Black Radish," *Raphanus sativus,* with notes; Mr. E. Cheel. fungi, *Stemonites fusca, S. ferruginea, Arcyria punicea, A nutans, Physarum cinereum,* and *Fuligo varians;* Mr. D. G. Stead contributed a report on the excursion to Mr. Heumann's aviaries at Beecroft.

May 5th, 1914.—Mr. A. G. Hamilton in the chair. Mr. C. Hedley, F.L.S., delivered a lecture on "The Origin of Australian Animals." The subject was dealt with in Mr. Hedley's lucid, happy style, and proved of the utmost interest to the large audience. Mr. A. A. Hamilton exhibited *Baeckea densifolia* and *Acacia pubescens,* with notes thereon; also a series of specimens illustrating the flora of the higher altitudes of the Blue Mountains.

Mr. D. G. Stead, early and mature fruits of *Eucalyptus globulus,* from Jenolan Caves.

June 2nd, 1914.—Mr. D. W. Shiress occupied the chair, and about 43 members and visitors were present.

The following were duly elected as members of the Society:—Miss Teece, Mr. Alexander Osborne, and Mr. B. L. C. Stoyles.

Lecture: A lecture entitled, "Observations in America," illustrated with a large number of lantern slides, was delivered by W. M. Carne, Esq.

Mr. Carne gave an interesting account of his travels in the United States of America, explaining the methods adopted for the cultivation of plants on the various experimental farms and irrigation areas visited; and also the methods of teaching in the numerous colleges and universities. Several views of the native vegetation, including the Cactaceæ, so common in Mexico, as well as a number of different plants, including Australian Eucalyptus, used for street planting. A cordial vote of thanks was proposed by Messrs. A. A. Hamilton and E. Cheel, and carried by acclamation.

Exhibits: Mr. A. A. Hamilton exhibited specimens of Styphelia tubiflora and Symphyonema paludosum, and read some interesting notes thereon.

Mrs. Spencer brought for exhibition an interesting specimen from Bundanoon, which Mr. J. E. Carne, F.G.S., explained, was *Spirifer Sp.,* a characteristic fossil of the Upper Marine beds of the Permo-Carboniferous Strata.

PORISMUS STRIGATUS.

By L. Gallard.

The parent stage of *P. Strigatus* is well known, but, so far, I have not been able to find any description of the larvæ, or any notes on the life history. In Mr. Froggatt's *Australian Insects,* p. 63, there is a figure of a larva, doubtfully supposed to belong to this species. During the last two years, I have been fortunate enough to get the larvæ and breed them out, and I now offer these few notes on the life history. The larva is long and ferret-like in shape, with head and 12 body segments. The segments are separated by such deep constrictions that they have a highly scolloped or beadlike appearance. The mandibles are long, and project almost straight out from the head longitudinally, but are turned slightly upwards towards the point. They are not turned inwards at the point like the other lace wings which have to grasp their prey while running about. These mandibles appear to be specially constructed, to enable the insect to drive them through bark to where its prey is concealed, in either cocoons or cells. The Antennæ are long, and generally carried curled at the ends, and the labial palps are also highly developed.

Eggs laid April 4th to 11th, hatched May 2nd to 5th. A number of cocoons which I collected hatched towards the end of March and early in April.

NATURE AND THE MECHANISTIC CONCEPTION OF LIFE.

By G. P. Darnell-Smith, B.Sc., F.I.C.

(Abstract).

Loeb regards the fundamental process, which is the elemental component of all psychic phenomena as *the activity of the associative memory or of association,* and by associative memory, he means the mechanism by which a stimulus brings about not only the effects which its nature and the specific structure of the irritable organ call for, but by which it brings about also the effects of other stimuli, which formerly acted upon the organism almost or quite sumultaneously with the stimulus in question. If we accept this, and I take it here as a working basis, we are then brought to the theory that only certain species of animals possess associative memory and have consciousness, and that it appears in them only after they have reached a certain stage in their ontogenetic development.

It becomes evident that the unravelling of the mechanism of associative memory is the great discovery to be made in the field of brain physiology and psychology.

And now in this connection I wish to put prominently before you an idea—an idea which I believe is original—that has, I think, an important bearing upon this subject and upon heredity itself.

We have to remember that all life phenomena are ultimately due to motions or changes occurring in colloidal substances. The question is which peculiarities of the colloidal substances can make the phenomena of associative memory possible. The answer to that question, I think, is that the behaviour of any colloid depends upon its previous history.

In support of this contention, I may cite the three following examples:—

(a) If a gelatine solution, after being kept for a short time at 70-80 degrees, is cooled, say, to 25 degrees, the value then observed for its osmotic pressure is considerably higher than it was before the solution was heated. Only after the solution has been kept some days is there a return to its former value. The osmotic pressure exhibited by a gelatine solution is, therefore, to some extent dependent on its previous history.

(b) A colloid belonging to the suspensoid class gives, with water, a mixture which is non-viscous and non-gelatinising, but is coagulated on the addition of small quantities of electrolytes. A colloid belonging to the emulsoid class gives, with water, a mixture which is viscous, gelatinises, and is not readily coagulated by salts.

With a colloid belonging to the former class, an amount of salt, which is not capable of causing immediate coagulation, is, nevertheless, effective after a certain interval, and the total quantity of electrolyte required to bring about complete coagulation of the suspensoid varies according as the electrolyte is added, all at once or in several portions successively.

(c) *The Danysz Phenomenon.*—The toxicity of a mixture of diphtheria toxin and antitoxin depends on the way in which the two are mixed. If the amount of toxin added is such that the mixture is untoxic, then in a second experiment, in which the same amounts of toxin and antitoxin are taken, in which, however, the toxin is added in instalments, the resulting mixture is toxic. This phenomenon is exactly analogous to what happens in the precipitation of a colloid by an electrolyte, or in the precipitation of one colloid by another; the amount of electrolyte or colloid required for complete precipitation varies according as it is added all at once or in instalments. The condition of a toxin in antitoxin mixture, therefore, resembles that of colloidal solutions in that it is not completely defined by a statement of its composition; *its character depends on its previous history.*

Now, in the case of a crystalloid, its character is constant, for example, a certain amount of acid neutralises a certain amount of alkali, and it does not matter whether the acid is added all at once or little by little, the same amount of acid is required in each case to effect neutralisation, and the products in each case are identical.

But in the case of a colloid, since its character depends on its previous history, and since each event in its previous history may have influenced its character, I see no difficulty in conceiving that contiguous colloids (in animal cells) influenced by different external stimuli to act reflexly may, in time, influence each other, and so act that one stimulus will bring about the same effect that all the different stimuli did previously, and this is the dawn of psychic phenomena.

Further, we have seen that the fertilisation of the egg may be brought about by purely chemical means, and here any hereditary characters must be carried by the egg.

But the egg and the spermatozoon are both of a colloidal nature, and since we have seen that the character of colloidal substances depends in the simple experiments quoted upon their previous history, it is not difficult to conceive that colloidal substances so complex as those of the egg and the spermatozoon, with a history in each animal of so many thousands of years behind them, should have become influenced and modified by the various stimuli to which, in the course of that time, they have been subjected, and hence reproduce faithfully, except for those slight variations which make natural selection possible, those animals from whose bodies they have arisen. Thus, it seems to me, from these considerations, that in colloidal properties, we have a pregnant suggestion as to the basis of heredity.

NOTES ON PSYCHOPSIS NEWMANI.

By L. Gallard.

This insect belongs to the Order Neuroptera, Family Hemerobiidae. The parent form measures about 1½ to 1¾ inches across the wings when outspread. These are broad and rounded, and make the insect appear in shape more like a butterfly. The colour is light buff, tinged with pink. In the fore wing we have a triple nervure, starting from the body and traversing the wing about one-eighth of an inch from the front margin, until it gets a little over two-thirds of its length, where it turns downwards and terminates. Another longitudinal nervure traverses the hind margin of the wing at about one-sixteenth of an inch from the edge. The space between these two nervures is filled up by radiating veins, which start from the frontal nervure and run backward to the hind margin of the wing; the space between these and the margin of the wing is filled with transverse veins. There is a cross vein which runs from one nervure to the other, about three-eighths of the way from the base of the wing, and another which runs around the wing about half-way from the main nervure to the margin, and from this to the margin the transverse and radiating veins are nearly all forked. About one-quarter of the way from the base we have a pinkey red blotch, running from the lower nervure across the main one, and about one-quarter of the way to the front margin. This is surrounded by a pencil line of darker colour. Towards the end of the wing we have another blotch of the same colour, about one-eighth of an inch wide, starting about the end of the hind nervure, and ending a little over half-way to the front one. At this point there are two dark spots, resembling eyes, from which three double dark coloured lines run upwards. The centre one crosses the main nervure near its termination, and extends forward to the cross veins. The side ones branch out V Fashion. There is also another small, lighter coloured spot near the base of the wing, and a number of small dark markings along the hind margin. All around the margin and along the veins the wing is covered with fine hairs.

The hind wings are smaller, but are much the same in structure. They are paler in colour, and have one dull round black blotch about midway between the termination of the two nervures. The body is fairly stout, and is about three-quarters of an inch long; but as the head is generally doubled under, it does not appear that length. The eyes are dark and prominent. Antennæ over thirty jointed, well developed, mandibulate mouth parts, with both Maxillae and Labial palps. The eggs are oval and dull in colour, and are laid flat, and not stalked like those of the green Lace wings.

The small larvæ, when first hatched, appear to be nearly all head, and their bodies are covered with fleshy tubercles. They are of a light slatey colour. As they develop the head gets smaller and the body larger, until at full-grown they have quite a different appearance. The fleshy tubercles also appear to diminish in size, and the colour to darken.

At full-grown the larvæ are from five-eighths to three-quarters of an inch in length from tip of jaws to tail.

The body consists of head and eleven body segments. The mouth parts consist of a pair of double-lobed, horny processes, which represent the mandibles and maxillae of mandibulate forms. The outer one is the widest, and is grooved on the inner side to admit the inner. The inner one is also slightly grooved, and fits closely into the outer, to form a channel through which the juices of the victim are conveyed into the buccal cavity. There does not appear to be any proper mouth opening. The proper sucking organs seem to be situated at the base of the inner lobe, and they thrust this lobe backwards and forwards in the outer cavity with lightning rapidity, each time bringing back with it a portion of the juice of the victim until there appears to be nothing but the skin left. The other appendages of the head are a pair of twelve jointed Antennæ, and a pair of five jointed labial Palps. I have not noticed any Maxillar Palps. The gait of the insect is clumsy, and though it walks forwards when calm, when frightened or excited it prefers to go backwards. The pupal case is a round silken cocoon of thin texture, and of a white glassey appearance. It is about the size of a small pea, and is slightly flattened on the sides. It is generally found in a dark, sheltered place, under the bark of trees. The food of the larvæ consists chiefly of small larvæ. When the parent insect first bursts from the cocoon and emerges, it does not leave its moult skin in the shell like the Antlion, but comes out in a sort of nymph form, and crawls about for some time. It then fastens on to an object with the abdominal appendages, the skin bursts at the back of the neck, and by a succession of wriggles and twists, the moult skin is cast off. After this it often takes five or six minutes before the wings are properly expanded. The first specimen I bred was from a larva taken by Mr. J. Blake, or Narara. This was taken as a full-grown larva in March, 1911. After keeping it till December 11th, 1911, it spun its cocoon in the box, and on January 16th, 1912, it hatched. Since then I have been able to find the larvæ in a good many different localities, and within the last two years have been able to successfully breed about two dozen specimens. I also got some of the females to lay fertilised eggs in captivity, and reared the larvæ to over half-grown. In 1904 I caught one of these Psychops in the parent stage at Kenthurst. This one laid over 50 eggs, some of which I hatched and developed to about one-third grown, when they perished.

In the larvæ stage these insects are highly cannibalistic, and therefore cannot be kept together. The following notes on specimens bred in captivity will give an idea as to the range and life history of these insects:—

Twelve specimens of *P. Newmani*, which pupated in captivity, took from 33 to 53 days before hatching. Most of these died within a day, but three specimens lived for about 22, 28, and 33 days respectively.

An adult female, taken at Kenthurst on December 10th, 1904, lived till December 31st, and in that time laid over 50 eggs. By January 3rd, these had hatched, and one lived till May 4th.

ORCHIDS COLLECTED AT LAWSON AND VALLEY HEIGHTS, APRIL, 1914.

By Miss F. Sulman.

Greenhoods, or Helmet Orchids,	Pterostylis grandiflora,	L.
	,, acuminata,	V.
	,, longifolia,	L.
	,, nutans,	V.
	,, obtusa,	L.
	Caladenia dimorpha,	L.
	Acianthus fornicatus,	V.
Ant Orchid,	Chiloglottis diphylla,	V.
Red Helmet,	Corysanthes bicalcarata,	L., V.
Parson's Bands,	Eriochilus autumnalis,	L.
Streaked Leek Orchid,	Prasophyllum striatum,	L.
Sturmia,	Liparis reflexa,	L., V.
	Bodlophyllum exiguum,	V.

L—Lawson; V—Valley Heights.

EXCURSIONS.

Mr. Heumann's Aviaries at Beecroft, N.S.W. (Saturday, February, 1914).—Great interest was manifested by the large number of members of the Society, who had the privilege of seeing Mr. G. A. Heumann's rich collection of living Australian and exotic birds, in his fine aviaries at Beecroft. The great variety of seed-eating birds in this collection alone, would make a very remarkable assemblage; but what surprises the visitor most, is the unique collection of insectivorous, frugivorous, and other birds, many of which need so much attention, and necessitate the preparation of strange and special foods. I would fain touch upon the latter in some detail, but space at present forbids, as I wish to deal mainly here with the kinds of Australian birds that were to be seen on this one occasion.

Among the exotic birds were gaudy Macaws from South America, the remarkable Kagu (Cagou) from New

Caledonia, wonderful Weavers of several species, the beautiful Shining Starlings from Africa, Californian Quail (including a clutch of 10 young), and many others.

It is the birds of Australia that claim our attention, however, and as most of the species represented had never before been seen at close quarters in the living state by many of those present, I here append a full list, as at the date mentioned above:—

Grain-Eating Birds.

Brown Quail.
Nth'n Territory Quail (Green egg).
Peaceful Dove.
Diamond or Red-eyed Dove.
Little Green Pigeon.
Bronzewing Pigeon.
Spinifex Pigeon (Sp.)
Squatter, or Partridge Pigeon.
Blue Mountain Parrot.
Galah.
Crimson Parrot.
Moreton Bay Rosella.
Stanley Rosella.
Blue Bonnet Parrot.
Many-coloured Parrot.
Crimson Wing Parrot.
Budgerigar.
Budgerigar (Yellow Var.).
Diamond Sparrow.
Fire-tailed Finch.
Zebra Finch.
Plum-head Finch.
Redhead.
Gouldian, or Painted Finch.
Picturella.
Masked Finch.
Blood Finch.
Blackthroat.
Red-billed, Long-tailed Grass Finch.
Yellow-billed, Long-tailed Grass Finch.
Chestnut Finch.
Black-rumped Double-bar Finch.
White-rumped Double-bar Finch.
Yellow-rumped Finch (N. Territory).

Insectivorous, Frugivorous, and Other Birds.

Common Seagull or Silver Gull.
Spurwing Plover.
Plain (Black-breasted) Plover.
Southern Stone Plover.
Australian Roller, or Dollar Bird.
Laughing Jackass.
Willy Wagtail.
White-shouldered Caterpillar-eater.
Coach-whip Bird.
Pitta.
Mountain Thrush.
White-fronted Chat.
Superb Warbler (Blue Wren).
Lambert, or Variegated Wren.
West Australian Red-winged Wren.
White-browed Wood Swallow.

Masked Wood Swallow.
Dusky Wood Swallow.
White-backed Magpie.
Black-throated Butcher Bird.
Crested Shrike Tit.
Rufous-breasted Whistler.
Yellow Robin.
Mistletoe Bird.
White-naped Honey-eater or Black Cap.
Blood-bird.
Spinebill.
New Holland Honey-eater.
White-cheeked Honey-eater, "White Whiskers."
Spiny-cheeked Honey-eater.
Yellow-throated Friar-bird.
Satin Bower-bird.
Regent-bird.
Cat-bird.

Many of the birds in the foregoing list are naturally shy in the extreme, and the observer who walks in Mr. Heumann's roomy aviaries will perhaps find himself puzzling over three things: (1) How it was possible to capture such birds; (2) How they are so readily tamed; and (3) How is it possible to satisfactorily feed, while in a state of captivity, such tender, wild things. Such birds as the glorious little Blood-bird, or Sanguineous Honey Eater, the dainty little Mistletoe-bird and the handsome Crested Shrike-Tit would appear to be particularly difficult to catch, as well as to maintain alive after capture. These, and nearly all the others, are caught with bird-lime in their native haunts, usually at feeding or drinking-places, frequently after many hours of patient search and waiting. It is in the pursuit of such birds, that the finest instincts of the bush-naturalist are developed, and where observations of habits are made that would never otherwise be recorded. As far as the taming process is concerned, I can personally testify in a small way, to what Mr. Heumann, and other keepers of our wild birds have found, that when treated in an attentive and effectionate manner, while suitably housed, they become quite tame very rapidly indeed. In the present case, Mr. Heumann has taught his feathered pets to love him, and it is a pretty sight, indeed, to see typical wild bush-birds, like the Wood Swallows and Whistlers (Thickheads) coming, when called, and perching on their friend's head, or flying past and swooping down to take the proffered grub or crumb.

One often hears it said that our Australian birds cannot be kept satisfactorily in captivity. The imposing list of "soft-billed" birds alone, given above, is a sufficient answer; but in the aviaries under discussion, the term captivity must be understood in quite a relative sense: so great is the freedom of the birds, that even the most sensitive objector to the caging of wild birds could find little to hurt his feelings here.

Space forbids that I should dwell more upon this subject, but I would like to refer to two observations made by Mr. Heumann—one relating to the Olive-backed Oriole, and the other to the Satin Bower-Bird. It was noted that when the Oriole was suffering from the fright of capture (whether by lime or net), the very pronounced red colour of the eyes was immediately lost, leaving a pallid white, which, of course, quite altered the appearance of the bird. Recently he caught a pair which he had and sent them to the Sydney Zoo. Upon capture the red colour disappeared, as when they were first captured; but this was immediately restored when they were put into the large enclosure at the Zoo. The Satin Bower Birds are said to have a decided penchant for the colour of blue, both in the aviary and in a wild state, decorating their bowers or playgrounds with any fragments of blue cloth, paper, or china, etc., or flowers, if available. Mr. Heumann says he has invariably found the bowers in a state of Nature, decorated specially with one small blue flower. The *irides* of this bird are of a blue colour, and it is suggested that perhaps this preference, if such really exists throughout the species, is due to the fact that their mates' eyes are blue.

In this connection it is worthy of note that a Bower, described by Leach in p. 185 of his ''Australian Bird Book,'' was decorated with blue flowers from the school garden, pieces of blue paper, blue hair-ribbon, besides blue parrot's feathers. Campbell, in his ''Nests and Eggs of Australian Birds,'' p. 193 (footnote), says: ''Mr. I. W. De Lany informs me that he has only noticed blue feathers at bowers. His wife, by way of experiment, put out several pieces of coloured wools near the house, and only the blue ones were taken to the bower.''

A quotation which the same author makes from the MS. of Herman Law, in regard to the occurrence of the bird in Southern Queensland, seems to indicate that the habit is not quite universal, because bowers are there mentioned as being decorated with ''Yellow and blue Lory Parrots' feathers,'' etc.

This Bower-Bird's liking for blue is evidently well established, however, and is worthy of attention.

—G. D. Stead.

NOTES AND COMMENTS.

OBITUARY.—There died at Milwaukee, U.S.A., on January 10th, Dr. George W. Peckham. This distinguished naturalist was born at Albany in 1845, and served in the American Civil War in a Wisconsin regiment. After the war he went to college, and subsequently graduated in medicine at the University of Michigan, in 1872. He did not follow this profession, however, but became principal of the High School at Milwaukee, which position he held until 1892, when he was made Superintendent of Schools. From 1896 to 1910 he was librarian to the Milwaukee Public Library. He was not only a member of, but held office in, several scientific societies. His death was the result of a stroke of apoplexy. He was a well-known author, and, with his wife, who collaborated with him, published numerous papers on the Arachnida and Hymenoptera, of the former group he was, up to the time of his death, one of the world's leading authorities on the family Salticidæ; in fact, he was second only to Mons. G. Simon, of Paris. A number of Australian species of this group were described and figured by him. The two best known works on Hymenoptera, by Dr. George W. and Mrs. Elizabeth Peckham, are "The Instincts and Habits of the Solitary Wasps" (1898) and "Wasps: Social and Solitary" (1905).

—W. J. RAINBOW (Australian Museum).

A BLACK RADISH (*Raphanus sativus, L.*).—A specimen of the above was exhibited to illustrate the effect of colour on articles of diet. The appearance of the "Radish" is hardly calculated to inspire confidence in its palatability, nor would it appeal to the artistic instincts of the "Chatelaine" in a scheme for table decoration, though it is as pleasant to the taste as its brighter-coloured brethren, and has a flavour distinctly its own. It is probably the "Black Spanish" variety, which is largely grown in the European countries bordering the Mediterranean Littoral.

—A. A. HAMILTON.

SATIN BOWER BIRD.—At the present time (May, 1914), a flock of about 17 of these handsome birds may be seen feeding on the fruits of the laurel immediately facing the Caves House at Jenolan. The trees are close to the road, and many visitors pass daily within a few feet of the birds.

—D. G. STEAD.

Vol. III.—Part 4. October, 1914.

— THE —

Australian Naturalist

JOURNAL AND MAGAZINE

— OF —

The Naturalists' Society of New South Wales.

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Edited by Thos. Steel, F.L.S.

The Author of each Article is responsible for the Statements and Opinions expressed therein.

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1914.

The Naturalists' Society
OF NEW SOUTH WALES

ROYAL SOCIETY'S HOUSE, ELIZABETH STREET,
SYDNEY.

Office Bearers, 1914-1915.

President—G. A. Waterhouse, B.Sc., B.E., F.E.S.

Vice-Presidents—A. G. Hamilton; W. W. Froggatt, F.L.S., F.E.S.; E. S. Edwards, M.A.

Hon. Treasurer—H. E. Finckh, 100 Raglan Street, Mosman.

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Hon. Editor—T. Steel, F.L.S., c/o Colonial Sugar Refining Co., Ltd., 1 O'Connell Street, Sydney.

Hon. Librarian—C. H. Wickham. *Hon. Lanternist*—C. J. White.

Other Members of Council—Miss A. Brewster; Miss C. M. le Plastrier; Miss F. Sulman; W. M. Carne; W. B. Gurney, F.E.S.; W. J. Rainbow, F.E.S.; D. W. Shiress; D. G. Stead, F.L.S.

Publication Committee—The President; Hon. Editor; A. G. Hamilton.

The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

NOTICES.

MEETING, OCTOBER 6th, at 8 p.m.—Royal Society's Hall—
Lecture: "Some Quaint Characteristics of Birds, Wild and Captive."
By Dr. E. A. D'OMBRAIN.

EXCURSION, OCTOBER 10th, to Fox Valley. Leader Mr. D. W. SHIRESS.
Train arriving Warrawee Station (Milson's Point Line), at 2 p.m.

MEETING, NOVEMBER 3rd, at 8 p.m.—Royal Society's Hall—
Lecture: "Geology of County of Cumberland."
By J. E. CARNE, Esq., F.G.S.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE

Australian Naturalist.

VOL. III. OCTOBER 6, 1914. PART 4.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.

July 7th, 1914.—Mr. W. W. Froggatt (Vice-President) in the chair, and about 42 members and visitors present. Mr. W. J. Rainbow, F.E.S., gave an interesting lecture on "The Spider: Builder, Engineer and Aviator." The lecture was illustrated with a fine series of lantern slides, showing structure of webs and the habits of various species. A great deal of information on distribution, life history, and methods of constructing webs and shelters was communicated, and altogether, the lecture was most instructive. Miss Busby exhibited beetles from the Solomon Islands, and Mr. Froggatt commented on the damage caused by some of these to the cocoanut palms. Miss Gladys Froggatt exhibited specimens of the Nardoo plant collected in the Brewarrina district; also aboriginal stone-axes and Nardoo seed grinding stone. Mr. A. A. Hamilton rare plants, including *Actinotus Forsythii, Rupicola sprengelioides and Epacris Hamiltoni;* also *Pultenaea glabra* and *Mimulus repens,* with notes. Mr. E. Cheel flowering specimens of *Hardenbergia,* from Hill Top; also *H. monophylla* var *rosea* and Wild Oats (*Avena fatua*) badly infested with uredo or rust, with notes.

ANNUAL MEETING.

August 4th, 1914.—Mr. A. G. Hamilton (President) in the chair, and about 80 members and visitors present. The following were elected members:—Mesdames Brake and W. Burley Griffen, Misses Clamp and F. M. Irby.

The Annual Report of the Council was read by Mr. Cheel and adopted. Mr. Finckh submitted the Annual Financial Statement, which was duly passed.

A ballot having been taken, the office-bearers, as given on page ii., were declared duly elected. The President then delivered the Annual Address, stating at the outset that he proposed not to deal with his own special work, but instead, to speak on general subjects of interest to the Society. In the course of his address Mr. Hamilton spoke of the immense value of birds in keeping insect pests in check, and referred to the appalling destruction through poisoning and the cheapness of pea-rifles. A birdless world, he said, would be a very unpleasant place to live in, through the consequent uncontrolled increase of insect life, to say nothing of the loss of the beauty and songs of the birds. In conclusion, Mr. Hamilton congratulated Mr. Waterhouse on the publication, in conjunction with Mr. Lyell, of their excellent work on Australian Butterflies; and he also referred to the notes on botanical and entomological subjects by various members, which have appeared in the *Australian Naturalist*, and are the kind of observational work required. Mr. Hamilton then invited Mr. Waterhouse to take up the position of President, to which he had been elected. Mr. Waterhouse, having returned thanks for the honour conferred on him, on the motion of Messrs. Edwards and Rainbow, special votes of thanks were passed to the retiring President, the Hon. Secretary, the Hon. Treasurer, and the Hon. Editor for their valuable services to the Society.

Mr. A. A. Hamilton exhibited *Olearia myrsinoides*, *Casuarina glauca*, and some rare *Epacris*, with notes. Mr. L. Gallard contributed a note on *Porismus strigatus*. Mr. Bickford drew attention to the interesting forms of *Drosera*, at Maroubra, and mentioned that in West Australia *D. Menziesii* grew to a height of 7 to 8 feet. Mr. Parry sent post-card greetings from Norway, the land of the midnight sun.

The retiring President offered some useful comments on the meeting of the British Association now commenced in Australia, and spoke of the value to Australia of the visit of so many eminent scientific men.

ORDINARY MEETING.

September 1st, 1914.—Mr. G. A. Waterhouse (President) in the chair. The following were duly elected members:—Misses Deer, B.A., B.Sc., Grossman, and C. E. Stead (junior member), Mrs. Garvin, and Mr. W. Burley Griffen.

Papers: "Short Notes on the Flora of Port Jackson" were read by Miss Sulman and Messrs. A. A. Hamilton and E. Cheel.

Miss Sulman exhibited diagrams illustrative of her paper. Mr. A. A. Hamilton read notes on *Bauera rubioides* and *Brachycome diversifolia,* and a series of specimens illustrative of higher Blue Mountain flora. Mr. E. Cheel living leguminous plants, together with fresh cultivated and wild plants, to illustrate the phenomenon of leaf-movement, opening and closing of flowers (or so-called sleep), and twining habits of plants. Mrs. G. A. Waterhouse 52 species of wild flowers collected in a small area at Woodford. Mr. G. A. Waterhouse a series of the fine sub-species *Tisiphone abeona,* from Eastern Australia. Miss C. le Plastrier lichens from Manly Heights. Miss Coghill fresh-water crayfish. Mr. L. Gallard life history of Bent-wing Swift Moth (*Leto staceyi*). Mr. Zeck collection of insects occurring in the nests of ants.

ANNUAL REPORT, 1913-14.

In presenting the second Annual Report of the Amalgamated Societies, ending July 31st, 1914, the Council have very great pleasure in stating that the past year has been even more successful than the previous one.

Forty-six new members have been enrolled during the year, which is very gratifying and most encouraging, as it shows that the advantages now offered to those interested in Nature Study in this State are becoming each year more generally known and appreciated.

During the year 23 formal resignations have been received, and six unfinancial names have been erased from the roll; while we have lost two members through death. This leaves a nett gain of 15 members, making a total of 264 on the roll.

In addition to the Annual Meeting in August last, at which the retiring President (Mr. E. S. Edwards) gave an interesting lecture on "The Naturalist Past and Present," there have been ten ordinary meetings, at which the attendances have been not less than 42; and on three occasions there were over 65 present, and on one occasion there were as many as 90. The lectures have been most interesting and instructive, and have embraced many branches of science.

The following is the list of lectures:—

"Natural History Notes in New Hebrides," by W. W. Froggatt, F.E.S., F.L.S.

"The Grand Canon of Colorado and Its Lessons," by E. C. Andrews, B.A., F.G.S.

"A Fern Hunt in Northern Queensland," by Rev. W. W. Watts.

"Sea Birds of Furneaux and other Islands," by W. Finigin, Secretary of the Gould League of Bird Lovers.

"On Nature and the Mechanistic Conception of Life," by G. P. Darnell-Smith, B.Sc., F.I.C., F.C.S.

"A Lecture and Lantern Demonstration on Bacteriology," by Professor D. A. Welsh.

"The Origin of Australian Animals," by C. Hedley, F.L.S.

"Observations in America," by W. M. Carne.

"The Spider: Builder, Engineer and Aviator," by W. J. Rainbow, F.E.S.

To the above gentlemen the Council beg to express its best thanks.

The exhibits at the Monthly Meetings have been varied and highly interesting and instructive, and in several instances valuable notes have been read at the meetings and published in the journal.

The Monthly Excursions have, as in former years, been held in various places of interest, and large attendances of members have been present on each occasion.

At Easter, a party of about 20 members spent an enjoyable holiday at Austinmer. A report of the latter has been kindly furnished by Mr. W. M. Carne, and will appear in "The Australian Naturalist."

The Council has secured the use of a room at Norwich Chambers, for the purpose of housing the Library. The Hon. Librarian (Mr. C. H. Wickham) is arranging the books, and hopes to be able to have them available for members' use at an early date.

Numerous additions have been made to the Library during the year, chiefly in exchange for our little journal.

The Hon. Librarian will be in attendance at the Library on Tuesday afternoons.

The thanks of the Council are due to the Hon. Editor (Mr. T. Steel), who has been most assiduous in his attention to the journal, which is becoming more popular each year, not only amongst our own members, but also those of other societies, as there is a brisk demand for back parts.

At present it is circulated to 49 different Institutions or Newspaper Office Libraries, etc., as well as to several private specialists; and during the year two complete sets have been sold.

As will be seen by the Honorary Treasurer's statement, the finances of the Society are in a sound condition.

E. CHEEL, Hon. Sec.

PRESIDENTIAL ADDRESS, 1914.

By A. G. Hamilton.

The present year has been marked by some notable events. One of these is the visit, now close at hand, of the British Association. The Association has previously visited Canada and Capetown, but this is the first visit to Australia. Another visit is scarcely likely in our time, and we should embrace the opportunity to see and hear great scientific luminaries, whose writings we have read and admired.

There can be no doubt but that this visit will give a decided fillip to scientific work here, but it will also have valuable results from so many leaders of science seeing this great country, and learning at first-hand what the problems are we are setting ourselves to solve.

Another event in which we take a great and almost personal interest is the publication of the long expected work on Australian butterflies, by Messrs. G. A. Waterhouse and Geo. Lyell. Mr. Waterhouse is one of ourselves; he is one of the founders of the present Society—Secretary, Past President, and member of the Council—and I am sure you all join in warmly congratulating the authors on the magnificent piece of work they have done. In the opinion of the best judges, it is the most important piece of entomological work yet done in Australia.

I might also allude to the formation during the past year of a branch of the Australian Forestry League in this State. All the States now possess Leagues, and it is proposed to form a Federation of these to combat what is beginning to be recognised as a serious danger—the great destruction of our forests without any adequate amount of reafforestation. The League hopes to interest the general public in this, so that the pressure of outside opinion may force upon the various Governments the necessity for replacing the destroyed forests.

The kindred subject of bird preservation is also an important one. It is scarcely necessary to point out the immense value of birds. Their work in keeping down insect pests is well known. But I think that their value, from an æsthetic point of view—their beauty, their songs, and their interesting habits—is equally important. A birdless world would be a very dull place.

The destruction that is going on comes under a number of heads:—

1. Justifiable Destruction: Certain birds are pests, and must be destroyed. But fortunately few come under this head, and of those that do, some are merely local pests. For instance, some of the honey-eaters in fruit districts attack orchards and vineyards. But in grain-growing districts these are rather beneficial, for they destroy insects. Unfortunately, in many instances, birds get a bad reputation. The beautiful little kestrel, for example, is entirely useful, living on insects, mice, etc., and yet they are shot whenever there is a chance.

2. Rabbit Poisoning: Here the destruction is incidental to the destruction of a serious pest, and not intentional. And yet it would appear that rabbit poisoning is not so effectual as other methods—such as digging out. Its main recommendation appears to be that it is easy to do and cheap. But if it destroys our useful birds it is likely to be very dear to the farmer.

3. The Destruction from Sport: I have heard a well-known sportsman tell of killing a thousand quail in one season. This is not sport but slaughter. As to the abominable so-called sport of pigeon shooting, it appears to me to be something only suited to savages.

4. Allied to the last is the shooting of all sorts of birds with pea rifles, just for the sake of killing apparently.

5. I am convinced that collectors both of eggs and skins are responsible for a great deal of bird destruction In other countries the field glass and camera are taking the place of the gun, and a few of our birdmen are setting a good example in this way. Yet we have amongst us the

collector, often paid by wealthy people in other countries, killing every bird that is met with, on the chance that it may prove to be a new sub-species or local variety; another crime committed in the name of science.

What is the remedy? There is a tendency nowadays to rely on legislation as a panacea for everything. And if properly administered, legislation may do much. There is likely to be an Animal Protection Bill brought before the State Parliament, which is to be on the lines long advocated by Mr. W. W. Froggatt, *i.e.*, there is to be no long schedule of names of protected birds, but instead, a short list of pests that may be destroyed. Such an Act, if efficiently administered, will do much; but if the work is to be added to the enormous load of duties already carried by the police, I see little hope of good results.

In this matter I put the highest value on education as a means of prevention. The Gould League of Bird Lovers and the Wild Life Societies are doing admirable work, and we may hope that their efforts will result in creating a feeling that the lives of our wild animals are sacred, and only to be taken under circumstances of extreme necessity. And every member of this Society should be a missionary, preaching the gospel of animal (and I may say plant) protection.

I may say a few words about the object of such Societies as ours. We call ourselves Field Naturalists, and are proud to belong to the category in which so many illustrious names are found—Gilbert White, Darwin, Wallace, Bell, Bates, Fabre, the Peckhams, McCook, Peach, Dick, Edwards, and Gosse. These are the men in whose footsteps we should aspire to tread. As field naturalists, we should all try to do something, however slight, towards solving the wonderful problems which we have all around us, problems which, from our unique fauna and flora, differ greatly from those which confront naturalists in other lands. Let me urge upon you each individually to undertake some little bit of work, some inquiry into the wonders of the world of life. We have already some in our Society who are doing this kind of work—Miss Mabel Brewster, Miss Froggatt, Miss Sulman, Mr. Wickham, and Mr. Gallard—not to mention those whose life-work is research. No doubt, many others are doing work quietly. But the fault I have to find with them is that they are doing it *quietly*. Why not tell us about it? If it is put on record, help and criticism will be available to help you to do better work.

It is just here that the second advantage of our Society comes. It brings workers in all branches of Natural History together. It is scarcely needful to say what an advantage this is.

There is no lack of subjects to work on, such as the life history of insects, the habits of Australian earthworms, the pollination of our native plants, the external adaptations of plants to dryness or moisture, or excess of salt in soil, the climbing of native plants, the sundews, the spiders and their habits, etc.

I am afraid I have detained you too long, but my excuse is that I feel strongly on this matter. I do not see much good in being a Field Naturalist unless you *are* a Field Naturalist.

In conclusion, I may express a hope that the coming year of the Society will exceed even the past year in prosperity; and also congratulate the Society on its incoming President, who is a shining example of what a Field Naturalist ought to be.

BOTANICAL NOTES.

AUGUST, 1914.

By Miss F. Sulman.

Acacia discolor, or "Sunshine Wattle." The flowers show considerable variation in colour. (1) Usually golden yellow at Lawson and other places. (2) Very pale cream, with very large flower balls, at Glenbrook, between Main Western Road and old railway line. (3) Cream and salmon-pink, petals and lower ends of filaments distinctly pink, near lagoon at Glenbrook.

The lagoon at Glenbrook is absolutely surrounded by *Wattles, A. rubida, A. longifolia, A. discolor, A. suaveolens, A. juniperina, A. myrtifolia.* There also occur:—*Boronia ledifolia, Hovea linearis, Pimelea linifolia, Stylidium graminifolium. Lissanthe strigosa,* deep rose pink, between Blaxland and Valley Heights. *Lysinema pungens* has particularly pink buds this season. *Epacris microphylla* also has pink buds.

NOTES ON OAT RUST.

By E. Cheel.

The specimens of "Wild Oats" and "Cultivated Oats" are very badly infested with a "rust," or the urèdo-stage of a parasitic fungus known as *Puccinia lolii avena.*

There are a large number of species of Puccinia, the uredo-stage of which cause serious losses to farmers through the attack of wheat, oats, barley, and numerous species of agricultural grasses.

C. B. Plowright, a specialist on this group of fungi, has drawn attention to the probable serious losses to farmers in other ways besides the actual loss of the actual crop, as will be seen by the following statement published several years ago:—"Instances of sheep, and especially lambs, having been fed upon rusty pastures or rusty rye-grass, have come under notice, in which they were attacked by a train of symptoms of greater or less severity, the most marked feature amongst which is a severe and irritating cough."

The writer asked the question: "Will the presence of uredo-spores of rusty grasses set up pulmonary irritation, and, if so, how?"

"There is a fact that sheep fed upon rusty pastures suffer from severe cough, and it is by no means difficult to imagine that the uredo-spores would germinate with great ease upon the moist mucous membrane of the sheep's bronchial tubes."

Although the above statement was published by Plowright as far back as 1882 (vide Gardener's Chronicle, November 25th, p. 691), I have not seen any further reference to the subject, so cannot say if tests have been made to see if there is any actual harm caused through sheep or lambs eating rusted crops. The matter is, however, highly important, and worthy of investigation, especially seeing that it is on record that certain smuts in the grains of cereals have been proved to be injurious, and that recent investigations show that certain other fungi have the power of secreting poisons in the tips of their hyphæ.

NOTES ON PORISMUS STRIGATUS.

By L. Gallard.

From the "Naturalist" for July last it will be seen that from eggs of *Porismus strigatus,* which were laid in captivity, a number of larvæ had hatched from May 2-5. These all moulted a few days after they hatched. They fed freely on small moth or beetle larvæ until July, when three, which were kept in separate tubes, cast another moult skin. The dates of these moults ranged from the 5th to the 13th. On the 18th one of these appeared to be full-grown, and actually spun a temporary cocoon in the end of the tube, which made me think it had settled down for the winter; but in a few days it emerged again and appeared just as lively as the rest. Since then they have eaten 4 Codlin Moth larvæ each, and have developed to such an extent that they are considerably larger than any I have taken in the bush. This carries me far enough to link on to the life-history, as observed in the bush, the last two years, when I collected specimens in September, which had already spun their cocoons and entered the quiescent stage. They remained as perfect larvæ until February, when they entered the pupal stage. These specimens hatched during March and early in April, but the chief part of the pupae collected later hatched in April, which seems to be the main hatching month. Like *Psychopsis Newmani*, these insects emerge from their cocoon in a nymph form, and sometimes run about freely for half a day before they break through and cast off their final pupal skin. Normal length of larvæ, when full-grown, ¾ to ⅞ of an inch. Although the eggs laid in captivity were not stalked, I think probably they would be when laid in the open, as the female appears to be provided with cerci, to enable her to do so. I have given these notes for the benefit of fellow-members, in the hope that it will stimulate others to take up the work; and I would like to ask any members who may collect the larvæ of any of these insects in their different localities, and who may not be in a position to develop them themselves, to kindly forward them along to my address—L. Gallard, Pembroke Street, Epping.

NOTES ON ANTS'-NEST BEETLES.

By E. H. Zeck.

Whilst collecting ants'-nest beetles at Kuringai, on June 29th, 1914, I took *Ectatommiphila opaca*, Lea, and a number of *Chlamydopsis epipleuralis*, Lea. These beetles belong to the Family Histeridæ, and are extremely rare. *E. opaca* was not known until about three years ago, when it was first collected at National Park by Mr. W. Du Boulay. This beetle has only been found in the nests of *Ectatomma metallicum*. *C. epipleuralis* was found in the nests of *Iridomyrmex gracilis*.

Nothing is known about the life histories of either of these beetles, but they are thought to be carnivorous.

Among other species taken were, in the nests of *Ponera lutea*: Family Pselaphidæ, *Tmesiphorus formicinus*, *Macl. Eupines flavoepicalis,* Lea. Family Scydmaenidae, *Scydmaenilla incerticornis,* Lea.

In the nest of *Ectatomma metallicum*, Family Staphylinidæ, *Polylobus semiopacus,* Lea. The following species were taken at Cook's River on July 25th. In the nests of *Iridomyrmex rufoniger*:—

Family Colydiidæ, *Kershawia rugiceps,* Lea, and *Nepharis costata,* King. Family Staphylinidæ, *Glyptoma Kingi,* Lea. In the nest of *Camponotus claripes,* Family Brenthidæ, *Cordus hospes,* Germ. At Cook's River on September 5th, *C. hospes* was taken in the nest of *Camponotus nigriceps.*

I am kindly indebted to Mr. W. Du Boulay for the identification of these beetles, and to Mr. T. McCarthy for the identification of the ants.

NOTES ON THE WILD FLOWERS OF PORT JACKSON DISTRICT.

By Miss F. Sulman (Abstract).

The second volume of my "Popular Guide to the Wild Flowers of New South Wales" is to be published this week, so I am venturing to explain the scheme of the books in which the locality is the central coast district and Dividing Range of New South Wales, with Port Jackson as its centre. The Port Jackson district, extending north to the Hawkesbury River, east to the Nepean, and south to Port Hacking.

Volume II. has 72 plates, and is complete in itself, with an illustrated glossary and colour index. It contains the descriptions of 21 families, among them the Wattles, Orchids, Daisies, Xmas Bush, Sundews, etc.

The choice of illustrations and cost of coloured plates were discussed, also the derivation of names, the simplicity of the keys, world distribution and flowering seasons.

A floral calendar of the best-known genera in the Port Jackson district was read, which had been prepared from the foregoing books, proving that although the seasons may fluctuate, the cycle of the floral calendar is unbroken in this district. And an appeal was made to members not only to see that unspoiled tracts of bush should be reserved, but to try and learn more about the cultivation of the native flora.

The 30 families here given are represented by about 208 genera in the Port Jackson district, of which—

162 genera have species that flower in spring.
140 " " " " " summer.
53 " " " " " autumn.
42 " " " " " winter.
33 " " " " " all the year.

EXCURSION TO NATIONAL PARK.

Saturday, June 6th.—The weather was splendid, and a party of about 35 members attended. The leader (Mr. E. Cheel) took the party to a few interesting plants, which are known to be comparatively rare.

The first was *Eucalytus Luehmanniana*, a somewhat straggling shrub of 15 to 18 feet high, with slender, smooth stems and angular branches more or less, of a glaucous appearance. Buds, flowers, and matured fruits were closely examined. A little further down the winding road leading to Audley a search was made for a pretty blue-flowering plant, *Mirbelia speciosa,* but the season being too early, no flowers were seen. Several plants of *Hakea propinqua* were seen, and the large rugose fruits were examined with interest. *Grevillea sericea* was in flower, and three distinct shades of colour in the flowers were noted. A few interesting fungi were also collected.

—E.C.

EXCURSION TO THE ROYAL ZOOLOGICAL GARDENS, MOORE PARK.

Saturday, July 11th, 1914.—Between 30 and 40 members visited the Royal Zoological Gardens, by kind invitation of the Council.

The President (Colonel Alfred Spain, V.D., F.I.A.) and the Director (A. S. le Souef, C.M.Z.S.) met the party and showed them around, and explained the more important exhibits, including a Wallaroo, rather different in colour to the Eastern form, which may probably be described as a new species or sub-species.

The fine collection of Australian Birds in the large flight Aviaries were of special interest to the members, and also the Aquarium, which has some interesting species of fishes and aquatic plants.

The members thoroughly enjoyed the visit, and concluded the afternoon's outing with light refreshments, kindly supplied by the Director, Mr. A. S. le Souef.

Mr. E. S. Edwards proposed a hearty vote of thanks for the kindness of the President and the Director in showing the members around, which was carried with much enthusiasm. —E.C.

EASTER EXCURSION.

APRIL, 1914.

About 20 members spent an enjoyable holiday at Austinmer. In spite of the usual seaside attractions, several excursions were held to the sea coast or the neighbouring bushes. Several of the more energetic visited the Bulli Pass and Loddon Falls. Entomology, Zoology (sea life) and Botany all had their followers. The botanists were perhaps numerically the strongest, and obtained the best results. —W. M. CARNE.

REVIEWS.

Australian Butterflies.—The publication of Messrs. Waterhouse and Lyell's book, "The Butterflies of Australia," marks the beginning of a new epoch in Australian entomology, for it brings the entomological work of Australians quite up to the level of the high standard reached within the last few years by the older seats of scientific learning in Europe and America. Nowhere amongst the many beautiful publications on Lepidoptera that have seen the light during the past twenty or thirty years do we remember having seen any book that reflects greater credit upon its authors, printers, and publishers. It has often been stated that the conditions of the printing trade in Australia make it impossible to produce locally such fine work as is done in London or Berlin. The printing and the plates, both half-tone and coloured, in the book before us, emphatically negative such an assertion. But it is above all in its scientific value, its clearness of conception and arrangement, and its evidence on every page of first-hand knowledge of the subject and mastery of an enormous mass of literature (on which any study of any portion of a fauna must nowadays be based), that the book claims the thanks and congratulations of all scientific men in Australia for its joint authors.

The object and scope of the work is avowedly systematic. It gives complete and accurate descriptions and figures of every one of the 332 species of butterflies so far recorded for Australia. With these descriptions and figures before him, the veriest tyro in entomological work cannot fail to name his captures accurately. In a brief but excellent introduction the technical terms and system of wing-venation terminology are fully explained, so that every description can be further elucidated, if desired, by a reference to this introduction. The authors have very rightly introduced the Trinomial System of Nomenclature into their book, for many of the species occurring in tropical and sub-tropical Australia are simply geographical races of species known before from various parts of the Oriental Region, and the trinomial system accentuates this relationship.

The descriptions are all based on one general plan, and are made as short as possible, compatible with completeness and accuracy. An excellent map of Australia shows the position of all the localities recorded, with enlarged portions inset, to show in greater detail those places round which collecting has been carried out most fully. After each locality, under any given species, the months during which the butterfly has been on the wing, are represented by numerals, so that every student can picture to himself the time and place of occurrence of each species. The descriptions seem in every case to be easily followed and understood. Certainly, in conjunction with the excellent figures of upper and under sides, they leave no room for doubt as to the identity of any specimen.

A general survey of the Butterfly Fauna of Australia, as described in this book, shows us how greatly two families of small but interesting species predominate. These are the *Lycaenidai* or "Blues," with 94 species: and the *Hesperidae* or "Skipper," with 92 species. Then these two families total between them 186 species, or well over half the total number recorded. One is apt to lose sight of this fact when contemplating the huge *Papilios* and other showy species that take up the greatest space in our collections. There is, amongst the smaller species, a large field still open, not only for the discovery of new forms, but also for the elucidation of many puzzling life histories. For those students who contemplate any excursions into this field of knowledge the present book is an essential basis of study. While we can look for nothing better in the way of accomplishment, we may, however, be allowed the hope that one day the authors of this beautiful work will give us the results of their researches into the life-histories of Australian Butterflies, and so complete this fascinating portion of our scientific knowledge.

—R. J. LILLYARD.

The Australian Zoologist.—This is a new publication issued by the Council of the Royal Zoological Society of New South Wales. The first part has made its appearance, and includes several papers dealing with zoological subjects, both of a technical nature and others of more general interest. Mr. A. F. Basset Hull advocates the need for more strict laws to protect our native birds and provide sanctuaries for them, pointing out what is being done in this direction in other countries. Mr. W. W. Froggatt makes some interesting notes on the habits of birds in the north-western part of New South Wales, while Mr. A. Gale describes the breeding habits of the Purple-striped Gudgeon.

A highly interesting paper by Mr. L. Harrison refers to the Mallophaga or Birdlice as possibly affording clues to bird phylogeny, it being suggested that the parasites, having altered less than their hosts over a long period of time, indicate the relationships of several groups of birds more clearly than the hosts themselves. Other more technical papers are contributed by several authors.

The large size (quarto) of the page, and the good quality of the paper, are important items of the publication, and make it specially suitable for the intercalation of figures with the text. The first part is well illustrated, and leaves no doubt that the Australian Zoologist will be a useful addition to our scientific literature.

NOTES AND COMMENTS.

Hardenbergia.—At the August meeting Mr. E. Cheel exhibited fresh-flowering specimens of *Hardenbergia* from Hill Top, New South Wales, which, he stated, were identical with the species figured in Bot. Mag. tab. 2169, under the name *Kennedya ovata,* which is included by Bentham in Fl. Aust., Vol. 2, under *Hardenbergia monophylla,* as a synonym. He also showed flowering examples of *H. monophylla* var *rosea,* an upright bush about two feet high without the trailing habit of the form common about Sydney.

Insects on Wattle Trees.—Whilst at Cook's River on October 11th, 1913, I collected *Nascioides carissima,* Water (a small Buprestid), in numbers on the leaves of Acacia longifolia. The tree was not in flower.

E. H. ZECK.

The Flora of Port Jackson.—The flora was treated from an oecological standpoint, its geographical features portrayed, the geological formation of the area outlined, and the physiographical conditions reviewed in relation to the adaptation of the vegetation to the varying environment found within the district. Examples of typical plants found on the ocean beaches and sand dunes, fresh and saline swamps, estuarine and fresh-water rivers, sandhills and waterholes, are noted. A brief description of the Xerophytic flora of the sandhills is given, and some distinctions drawn between the vegetation found on the Wianamatta shale and the Hawkesbury sandstone.

A. A. HAMILTON.

BALANCE SHEET, YEAR ENDING JULY 31st, 1914.

RECEIPTS.

	£	s.	d.
To Balance	94	12	4
„ Subscriptions	73	9	0
„ Sale of Publications	1	16	3
„ Advertisements in Journal	5	0	0
„ Interest Savings Bank	5	8	9
	£180	6	4

DISBURSEMENTS.

	£	s.	d.	£	s.	d.
By Rent of Hall				10	10	6
„ Printing Journal	22	15	10			
„ „ Rules and Cards	3	11	3			
				26	7	1
„ Typing, Posting Journals, etc.				18	10	3
„ Petty Expenses				6	12	7
„ Bookcase				3	13	6
„ Balance in Bank	107	19	9			
„ Cash in Hand	6	12	8			
				114	12	5
				£180	6	4

Examined and found correct—

A. A. HAMILTON,

D. W. SHIRESS,

Hon. Auditors.

H. E. FINCKH,

Hon. Treasurer.

Vol. III.—Part 5. January, 1915.

— THE —

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— OF —

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The Author of each Article is responsible for the Statements and Opinions expressed therein.

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1915.

The Naturalists' Society
OF NEW SOUTH WALES

ROYAL SOCIETY'S HOUSE, ELIZABETH STREET,
SYDNEY.

Office Bearers, 1914-1915.

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Vice-Presidents—A. G. Hamilton; W. W. Froggatt, F.L.S., F.E.S.; E. S. Edwards, M.A.

Hon. Treasurer—H. E. Finckh, 100 Raglan Street, Mosman.

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Hon. Librarian—C. H. Wickham. *Hon. Lanternist*—C. J. White.

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Publication Committee—The President; Hon. Editor; A. G. Hamilton.

The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

NOTICES.

MEETING, FEBRUARY 2nd, at 8 p.m.—Royal Society's Hall—

Paper: "A Chat on Australian Moths."

By G. M. GOLDFINCH.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE

Australian Naturalist.

Vol. III. JANUARY 5, 1915. Part 5.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

October 6th, 1914.—The President, Mr. G. A. Waterhouse, B.Sc., F.E.S., occupied the chair, and about 50 members and visitors were present.

Misses Abrahams and Walker were elected members of the Society.

Dr. E. A. D'Ombrain gave an intensely interesting lecture on "Some Quaint Characteristics of Birds."

Exhibits: Mr. Finckh, a chick and photograph of Kagu (*Rhinochetus jubatus*), native of New Caledonia, kept in captivity, and read some interesting notes on their habits and method of rearing their young. Mr. Zech, some carnivorous ground beetles. Miss Le Plastrier, some interesting plants. Mr. Gallard, specimens of Red Gum Moth, with notes on their life history. Mr. A. A. Hamilton, a series of specimens illustrating the flora found in the neighbourhood of Duck River (Clyde), showing the introduction of plants by stock from various parts of the State; also several species rarely found in the Port Jackson district. Mr. Cheel gave information on some Lichens exhibited by Miss Le Plastrier.

November 3rd, 1914.—The President, Mr. G. A. Waterhouse, B.Sc., F.E.S., presided, and about 52 members and visitors were present.

Miss Austen was elected a member.

Mr. J. E. Carne, F.G.S., gave an interesting lecture, illustrated with a number of slides, entitled "The Geology of the County of Cumberland." An abstract of the lecture will appear in the journal.

Exhibits: Mr. A. A. Hamilton, a series of mounted specimens, chiefly from the Blue Mountains, illustrating geographical distribution, with special reference to the occurrence of *Melaleuca hypericifolia*, at Wentworth Falls.

December 1st, 1914.—The President, Mr. G. A. Waterhouse, B.Sc., F.E.S., presided; and 76 members and visitors were present.

A very instructive lecture was delivered by Professor W. M. Wheeler, Professor of Economic Entomology at the Harvard University, U.S.A., on "Ants and Their Ways."

Exhibits: Mr. Carne explained a series of exhibits showing stages of development in oats, maize, barley, and wheat. Mr. Froggatt, slow-worm, *Tyllops grammaticus,* and *Coxinocera hercules,* largest Australian moth, from Cape York, North Queensland. Mr. White, some interesting exhibits of Volvox, under the microscope. Mr. A. A. Hamilton, a series of mounted specimens, illustrating the effects of environment, exhibiting interesting morphological characters, or extending the range of geographical distribution. Miss Le Plastrier, leaf impressions of Tertiary age from Richmond River, and some interesting Hepatics. Mr. A. G. Hamilton, seedling of *Viminaria denudata,* showing trifoliate and simple leaves. Mr. L. Gallard read entomological notes; and Mr. Zeck, notes on fly parasites of the case moth. Mr. Cheel, a spider from Hill-Top, together with its home in some soil, with the trap-door consisting of a round wad-like pellet, which was explained.

Miss Irby sent some interesting specimens, together with colour, notes of fruits, and notes thereon, from Casino. Archdeacon F. E. Haviland sent for exhibition three photos, showing—(1) Ringing done by Gelars, (2) of Kurrajong from Gum Stump, and (3) of Wild Orange from Gum Stump. The photos were taken by Mrs. G. H. Officer, at Archdeacon Haviland's request, in the neighbourhood of Cobar.

CONDITIONS FOR PRIZES FOR BOTANICAL AND ENTOMOLOGICAL ESSAYS.

Mr. E. Bickford has offered a prize of £1 1s. worth of books, or instruments, for the best essay on "Climbing Methods in Australian Plants," illustrated by a collection, and if possible, drawings.

The President, Mr. G. A. Waterhouse, B.Sc., F.E.S., etc., has offered a prize of "The Butterflies of Australia," or an order on a bookseller for books to the value of £1 5s., for the best essay on "The Insects Associated with *Acacia decurrens.*

Conditions: The essay should, as far as possible, be accompanied by specimens and sketches, and should deal rather with the habits of the insects in relation to the plant than consist of a mere list of species found on this particular wattle.

The essays are to be lodged with the Secretary not later than May 31st, 1915.

E. CHEEL, Hon. Sec.

FLY PARASITES OF THE CASE-MOTH.

By E. H. Zeck.

During August, 1914, an apparently full-grown larva of Saunders' case-moth, *Metura elongata,* was given to me by Mr. A. A. Mitchelhill, of Mosman, who had observed it clinging to the wall of a weatherboard building.

The case was covered with pieces of rose stems about three-quarters of an inch in length.

On being placed in a breeding cage it refused food, and about a week later it was lying on the bottom. I then saw two or three small brown pupa cases lying alongside, and on cutting the case open I found the whole of the interior filled with these pupae, while of the larva, only the dried skin remained. There were no less than 108 pupae, their average length being 7 m.m. About a month later the pupae were all found to have died; the cause of their death I do not know, as they all seemed to be just about to emerge. As none have emerged, I am unable to name the species of these flies. Probably they are Tachinidae.

NOTES ON THE FLORA AND FAUNA OF CASINO DISTRICT, OCTOBER, 1914.

By Miss F. M. Irby.

Along the creek banks many of the brush trees are in flower; towering above most others, the *Grevillia robusta,* a brilliant mass of orange, with honey-eaters and parrots chattering amongst the branches. The big white-and-wine coloured Hibiscus (green Kurrajong). The star-like white-and-yellow *Hymenospermum flavum,* two *Nepheliums, Pittosperum revolutum, Dysoxylon rufum,* The smell of this wood surpasses that of the beautiful *Albizzia pruinosum.* Once, in all ignorance, drying a large quantity of the former flower, I thought there was a dead cat under the floor.

The handsome *Geijera salicifolia* is a mass of branching white, and *Rhodosphaera rhodanthema* looks like drifts of pink coral. Every twig on the 'possum nut (*Rapanea variabilis*) is a clustering mass of tiny flowers. And the small-leaved variety of *Cupania anacardioides* is bright with its small yellow bells. (Please would somebody tell me, have the small-leaved and the large-leaved varieties of this tree only one name between them? Or has the small one a name of its own?)

Some of the Melaleucas and Callistemons are flowering. Last summer a small shrub of Callistemon, growing low over the creek, was in flower (I do not know its name—a straggly variety with red flowers), and, floating above it, and resting upon it, were fully two dozen great black and green butterflies—*Troides richmondius.* Slowly, lazily, with their soft wings scarcely moving, they would drop to the sand below, or cling momentarily to the reeds that dipped to the water's edge, then drift dreamily back to their nest amongst the red flowers.

There have been a great number of mistletoe birds, *Dicaeum hirundinaceum,* about these last two seasons. They search for insects in the shrubs about the garden; also come for mulberries and privet berries when these are ripe.

Last November a pair built in a wattle tree in the garden. For some days they merely looked for a building site, singing ceaselessly as they flew, with quick jerking flight, between the garden and the swamp. But once they decided which tree to live in they lost no time about building.

The poor little hen did all the work; she carried the materials, and wove the wee, white nest, while her beautifully-dressed mate sat on a bough and watched her, singing at the top of his tiny voice, and telling her the way she should do it; and every time she flew backwards and forwards with building materials he flew too, but he wouldn't soil his dainty beak and claws with work.

She was a perfect slave—poor little bird!—but she seemed perfectly happy. In three days she had built the outer part of the nest; in four more she had added a lining of soft brown felt. The three white eggs were laid between eight and nine o'clock on each succeeding morning. And the tiny chickens were hatched in eight days.

The photograph exhibited shows the curious way in which the white-fronted Heron, *Notophoyx Novae-hollandiae,* while holding its leg rigid, paddles rapidly with its toes to stir up insects. The bird shown is a tame one, which has lived in the garden for about fifteen months. It seems to possess a keen sense of taste, and if given a piece of salt meat, or anything with grease or pepper or anything strongly flavoured on, it picks it up gingerly in its beak, and, carrying it to the water, washes it vigorously before eating.

OBSERVATIONS IN AMERICA.

(Lantern Lecture Delivered 2nd June, 1914.)

By W. M. Carne.

By drawing a line from north to south through the centre, the United States may be roughly divided into an eastern humid area, with the remainder for the most part arid or semi-arid. In the N.E. the rainfall is distributed throughout the year, and the winters are cold. This region is characterised by elms, pines, oaks, maples, etc. The climate of the S.E. is one of summer rainfall and tropical or semi-tropical in character. The central prairie States, marked by a grass vegetation, particularly of *Boutelona* and the true Buffalo grass (*Bulbilis dactyloides*), may be divided into a northern half with cold winters, and a more arid and warmer southern half. Of the arid States, Nevada and Utah form the sagebush (*Artemesia*) region, while Western Texas, New Mexico, and Arizona carry, especially in their less elevated parts, a peculiar vegetation of cacti, mesquite (*Prosopis*), and Greasewood (*Sacrobatus*), and Yuccas. California is in general arid with a flora of winter annuals, that being the season of rain and plant growth. The giant redwood characterises the moister and more elevated parts. Cottonwoods, oaks, and walnuts are common throughout the south-west, whilst species of conifers range the whole length of the Rocky Mountain area.

In the N.W. is a humid region of big timber trees and rough country, with the Douglas Fir as the outstanding species.

Commencing from San Francisco, the lecturer showed the magnificent Greek Theatre of the University of California, beautifully situated amongst tall eucalypts on the highlands of Bakeley, overlooking San Francisco Bay. California, with a population one-third greater than New South Wales, has about 12,000 students in its several Universities. So strong is the desire for University education in America that many students, frequently one-third in Agricultural Colleges, earn enough to pay their way; whilst many more earn part of their expenses. It is a common thing, and one that earns respect rather than discredit, for students to earn money by domestic duties, farm work, agencies, etc., both for the University or College, or outside employers.

Reference was made to the great railroad systems, which contain one-half of the world's mileage.

In many ways we can take example from them, particularly in regard to uniform gauges, low grades, large engines, trucks, and trains, covered trucks, bulk-handling of grain, pre-cooling and refrigerating systems for perishables, express freight trains, steel passenger cars, and "railroads before settlement."

Some features of the irrigation systems of Utah were shown. The world owes a great debt to the Mormon people, who laid the foundation of modern irrigation systems, and who started the great movement that is slowly wiping the word desert off the map of the world. Three dangers have made themselves apparent in the irrigation of arid areas in Utah and elsewhere, namely, (1) the waterlogging of low valley land by excessive irrigation on higher levels; (2) the accumulation of alkali in the surface soil, destroying plant growth; and (3) settlement beyond the capacity of the water supply available.

Reference was made to the excellent Agricultural Colleges which are maintained by Federal endowment and State subsidy, and pictures were shown of those of Utah at Wisconsin. The latter is particularly interesting to Australians, for there is still to be found Prof. Babcock, whose free gift to the world of his invention, the Babcock Milk Test, has made possible the great co-operative dairy industry of Australia. Wisconsin is considered one of the most advanced and highly-developed States, a very interesting fact when it is realised that the State is practically controlled by its University. Even legislation must receive its approval before becoming law. The position of education in America is further shown in the election of Prof. Woodrow Wilson to the Presidency.

A new era seems probable in American politics, in which the governing power will be in the hands of trained men of the highest character.

Passing, then, to the south-west, to Oklahoma and Western Texas, the origin of the prairies was discussed. They were shown to be not so much natural plant communities, but to have been artificially preserved by the practice of the Indians to fire the old grass every year to encourage new growth for their horses and the vast herds of buffalo, etc., upon which they lived. This herd, travelling north and south with the seasons, kept the pastures in good heart by periodical grazings and rests. To-day the northern prairies are farmland. To the south, the over-stocking which accompanied the white man has resulted in the loss of grass, and a serious depreciation in the grazing capacity of the land. Grass fires are no longer possible, and from the hilly and rougher country there is spreading on to the grazing land thickets of cacti, acacias and mesquite, which, though having a certain value, are not equal to the grasses they replace.

In regard to the cacti, it is evident that the natural conditions which have controlled their distribution in the past, have been definite limits of cold and drought and grass fires. Insects, fungi, etc., have played a little part in checking them. To-day, in the absence of grass fires, cacti are spreading within the climatic limits.

Cacti are being increasingly used for stock forage in conjunction with cotton-seed meal, a highly concentrated food cheaply available. They are now being cultivated, particularly the spiny forms, which have several advantages over the less hardy spineless forms.

Date growing has become an established industry in the hottest and driest districts of Arizona and California where water is available for irrigation, and is finding a use for land otherwise of little value.

Reference was made to Mexico and the influence the early Spanish settlement has had upon California, particularly in regard to the so-called mission style of architecture and furniture.

Pictures were shown to illustrate the marvellous change which has been wrought in barren valleys by irrigation. The beauty of some of the scenes in Southern California is hard to imagine. One may stand under giant Australian eucalypts and gaze across miles of orange groves, concealing cities in their greenery to the startling contrast of snow-capped peaks. The Californians are proud of their State, and have done much to beautify it. There are beautiful avenues and well-planted streets and parks, and many even of the streets are park-like. This beautiful effect, with its sense of space, has been obtained by omitting all dividing fences. Certainly the Americans have shown us that the best protection against people is to trust them.

The lecturer concluded with pictures of the magnificent Mission Inn and the famous Magnolia Avenue, with its five miles of blue gums, pepper trees, and palms, at Riverside, Southern California.

GEOLOGY OF THE COUNTY OF CUMBERLAND.

(Abstract.)

By J. E. Carne, F.G.S.

The lecturer described the geological formations represented in the County, beginning at the oldest, reached by drill-bores, and in the Balmain Coal Shafts, viz., the Upper Coal Measures or uppermost division of the Permo Carboniferous.

The lower members of this important system were briefly discussed before consideration of the geological section superimposed on them.

The economic value of the Upper Coal Measures was depicted in the numerous workable coal-seams in the northern, southern, and western extensions of the division.

The stratigraphic positions of the coal-seams—relative to sea level and each other—were rapidly noted, as the measures were followed from above, and about sea level at Newcastle and Lake Macquarie, on a gradually increasing southern dip into the deep depression under Sydney—nearly 3,000 feet deep—from which they emerge above sea level at Coal Cliff, about 30 miles south of the Metropolis, and continue rising along the face of the Coast Range to the southern limit of the division.

From the Western Coalfield another great warp was explained, intensified by the monochinal fold beginning at Glenbrook. The sedimentation was described, and the effects of igneous intrusions on portions of coal-seams.

The life of the period was illustrated by lantern views of characteristic fossils—both animal and plant, the absence of the higher types of both kingdoms of nature attesting the stage of physical evolution reached.

The next great division in the Section—the Trias—was described as beginning immediately above the top coal-seam, and consisting of three great divisions in ascending order—the Narrabeen beds, the Hawkesbury sandstone, and the Wianamatta beds.

Though no stratigraphic break occurs between the Upper Coal Measures and the Trias, the regular sequence being maintained, nevertheless, palæontology indicates (with one solitary exception that proves the rule) a marked palæntological unconformity; the abundant and characteristic Glossopteris flora of the coal measures abruptly giving place to sparsely represented, and mostly macerated, plants of a later age, and with them Mesozoic fish and labyrinthodont remains.

The Hawkesbury series, which form such stupendous cliffs on the seaboard and in mountain gorges, were cited as an instance of estuarine deposition in a slowly subsiding basin—one continually being filled, yet never full—the rate of subsidence and filling being about equal, as witness the enormous thickness of sedimentation bearing throughout evidences of shallow deposition—in wave-marks, current-bedding, sand-cracks, and rain-prints.

The well-known "Chocolate Shales" were pointed out as the dividing line between Narrabeen and Hawkesbury. These shales consist of finely triturated volcanic dust from volcanic outbursts, contemporaneous with the deposition.

The Wianamatta Shales, which mark the close of the Triassic period, consist mainly of fine still-water sedimentation in lakes, or eroded hollows, of the Hawkesbury sandstone; surface plasticity, and absence of coarse sand render these shales eminently suitable for brick and pottery purposes, for which they are largely utilised in the vicinity of the metropolis.

The characteristic fossils of the Trias were shown on the screen. All the animal types belong to fresh or brackish water conditions, with the doubtful exception of a reappearance of a detached silurian form (*Tremanotus Maidenii*) at Cockatoo Island, and the undoubted occurrence of Foraminifera at Kurrajong, which appears to prove subsidence, and encroachment of the sea, about the close of the Wianamatta.

It was pointed out that the fossil fish of the Hawkesbury series embraced representatives of Old Devonian forms, and connecting links between Devonian and Carboniferous times and the Mesozoic; and further, that in the Port Jackson shark, and the *Ceratodus Forsteri* of Queensland, Australia possesses living links with the cartilagineous and ganoid fishes of the Devonian.

LIFE HISTORY OF RED GUM MOTH.

By L. Gallard, Epping.

Family Cossidae, species (*Culama rubiginosa*). On April 28th, 1914, I bred one of these moths from an imago taken from a Red Gum Tree at North Ryde. The parent moth is of medium size, measuring from 2 to 2½ inches across the outspread wings. The colour is bright grey with black leopard-like bands across the fore wings. When at rest the wings are folded fairly close into the body. The antennae of the male are slightly combed, but are only about one-sixteenth of an inch wide.

The larvae are flattened, bright, pinky red in colour, and measuring when full-grown from 1½ to 2 inches in length. When hatched they start eating into the bark of the red red gum, and work their way around the tree between the outer bark and the sap wood, until it is sometimes almost ringbarked. When fairly well developed, they often eat a tunnel into the wood, into which they can crawl for shelter like the Cryptophagidae (plum tree girdlers, etc.); but I do not think they make it with the view of feeding on the wood or of pupating in it, as I never saw a pupa shell sticking out of one. I have noticed a rough webby cell made in the tunnel under the bark, and the one I bred made a rough webbed cocoon in the bottle she was in. The larvae, when developing, have, on account of their flat form, the resemblance of a large carab beetle larva. They may be found in clusters of a dozen or more in one tree. I saw one tree at Epping which must have had at least 50 or 60 of these grubs. as they ate all the bark off one side for a distance of 12 to 15 feet. When feeding, they never eat right out through the bark, but leave just the outer skin. This hardens, cracks, and falls off in time, and leaves the wood exposed. When there is a large batch in the one tree they often eat into the sapwood of the tree a little, forming shallow tracks in it.

After wet weather, very often there is a manna-like exudation from the wounded part, which is sweet, and has a strong smell. This proves a great attraction, and a wholesome food for many other insects.

Mr. Gallard also exhibited another moth (*Ptilomacra senax*), which is classified as a Liparid; but he was inclined to think it should be in the Cossidae, as it appeared to be very closely allied to *Culama rubiginosa,* and was very often taken in the same locality. So far he had not been able to breed one of these, and he would be glad to hear if any other member had. This moth is from 2 to 3 inches across the wings, is dark grey in colour, and has an abnormally wide combed antennae.

NOTES ON THE BENT-WINGED SWIFT MOTH, *LETO STACEYI.*

By L. Gallard.

The adult is one of our largest moths, sometimes having a wing expanse of 9½ inches. Although it has a great wing expanse, the wings are not nearly so wide transversely as those of the *Zenzera,* or wattle moths. The texture of the wings is lighter, and the scales are not so thick, and are easily rubbed off. The front pair are curved on the hind margin towards the end (hence the term bent-winged). The two front nervures are very strong, and the space between them has a mottled velvety appearance. The remainder of this pair varies from light brown to orange, and the hind part has a lovely water-waved appearance, showing a light bluish sheen when the light is thrown upon it. They also have a pair of peculiar large eye-marks. The hind pair are a plain orange colour, and in the male particularly are covered near the body with long hair, which gives them a lovely appearance. In this section there is also a triangular shaped band of dark brown in the front wing, but the remainder is of a lighter colour, which makes it look brighter. The body also is much lighter than that of the wattle moth. The head is narrow, antennæ fine. The two front pairs of legs are very long and highly pubescent. The hind pair are much shorter. The abdomen is slender, orange-coloured, tipped with black. A good figure can be seen in Mr. Froggatt's Australian Insects.

The eggs are round and nearly black, and are about the size of radish seed.

The larva is a long, slender brown grub, with orange-coloured transverse bands on the back. When hatched, it starts eating its way into the tree. While doing this it covers itself over with a felty covering made from the bark chewings and a little silk which it spins. This protects it from the ravages of other insects, and also keeps the water out of its tunnel in wet weather. It tunnels down the tree from nine inches to a foot, and then works up and down, eating the tunnel larger as it develops, until the hole is large enough to admit a man's finger. When fully developed in this stage, it draws all the felty covering in, and with the aid of a little more silk, makes a cap like a thick felt gum wad, which fits so closely into its tunnel that nothing else can get in. The development of the larvæ takes two years, and in some cases it may take more; but in several cases I had under observation they developed in two. When they enter the pupal stage they can move up and down freely in their hole by means of rings of spines on each segment.

When fully developed, the pupa works its way up and pushes the wad out, and there rests with the head protruding until the shell breaks at the thorax and lets the mature moth emerge. This always happens late in the afternoon, and they hang there by the front legs until the wings have expanded. By this time night has come on, and they fly off, and are rarely seen again. Possibly on account of their size a good number of them fall victims to night flying birds.

A good number of the larvæ are also killed by a white fungus, if too much moisture gets into their tunnels in wet weather. Although great provision is made against it, these large moth grubs sometimes fall victims to parasitic wasps.

THE SPIDER: BUILDER, ENGINEER, AND AVIATOR.

This was the title of a lecture delivered by Mr. W. J. Rainbow, F.E.S., on Tuesday, July 6, at the Royal Society's House. This lecture had been previously delivered at the Australian Museum, and had proved so interesting that it was decided to repeat it at one of the monthly meetings of the Naturalists' Society. On the evening referred to there was a large attendance of members, and the lecture, which was listened to most attentively, was illustrated by a series of upwards of fifty beautiful lantern slides.

In a state of Nature there are no animals that fall more generally under observation than spiders, nor are there any less perfectly understood. It is usually the custom for that mythical yet paradoxically ubiquitous person, "the man in the street," to regard spiders not only as uncanny, but even ugly and dangerous! It is true that the form and colour of many species fail to appeal to the often so-called aesthetic mind, nevertheless there are hundreds of species that are not only pretty, but even absolutely beautiful, and among the latter there are some that rival the gaily painted butterflies. To the true naturalist, nothing in Nature is really ugly; everything has some beauty, some charm, and if the naked eye fails to discover it, the microscope soon reveals the fact. That spiders are dangerous is an old fable, and it is about time it was dead and decently buried. The common house-fly, which John Ruskin declared to be the "queen of the air," is unquestionably a real danger to man; but the much maligned spider, on the other hand, is not only *not* dangerous, but a useful ally to man, as it destroys hosts of the baneful *Musca domestica*, as well as other noxious insects. Mr. Rainbow gave a general outline of the great order Araneidæ, and their web-building habits, and demonstrated by the aid of the lantern many different types of snares, such as the orb-webs of the common garden spider, the beautiful snare of *Argiope altherea,* with its St. Andrew cross design at the centre, and which gives it the popular name of "St. Andrew Cross Spider"; the beautifully-decorated webs of spiders of the genus *Uloborus;* and the complicated and "compound" structures of certain species of *Araneus*. The work of the different types of trap-door spiders and turret-builders was also described and illustrated, as were also those of the diving spiders and raft-builders.

The lecture concluded with the description of process of "ballooning," a method by which young spiders are distributed, and several lantern slides were shown in illustration of this side of the subject. Young spiders generally "fly" off in swarms; indeed, they have occasionally been met with far out at sea, and out of sight of land. Darwin and other travellers have recorded this fact, and the lecturer stated that he had seen baby spiders clinging to the "shrouds" of one of our interstate ships when travelling along the New South Wales coast on a voyage from Melbourne to Sydney. The steamer was off the south coast, and a fairly strong westerly breeze was blowing at the time. The final lantern slide was a map illustrating the track of the "Huntsman Spider," a species which has "circum-aviated" the world. This species, *Heteropoda venatoria,* originated in the Indo-Malaysian area, from whence it was carried west by the north and south trade winds. This journey must have occupied many generations of these tiny aeronauts, and it is significant that this species is only found in those countries and on those islands that fall directly within the trade-wind belt. In fact, it affords an interesting topic for discussion when the geographical distribution of animals is under consideration.

EXCURSIONS.

The excursion to Heathcote on Saturday afternoon, December 5th, was attended by between 30 and 40 members.

Professor H. M. Wheeler also accompanied the excursion, and members were much interested in his easy way of studying ants in the field, and learned a good deal about them. Mr. Froggatt was with the members, and much helpful information was gathered from him concerning the numerous insects.

Mr. Cheel pointed out the way to the Woronora River, where the weir separated the salt water from the fresh, and pointed out that some interesting species of plants would be found there if members cared to make a special trip.

The most interesting species known to be found there are *Leucopogon exolasius, Monotoca ledifolia, Bertya pomaderioides, Grevillea asplenifolia, Dampiera Brownii, Pseudanthus pimelioides,* and *Boronia polygalifolia var robusta.* Meanwhile, members were very busy in gathering Christmas bells (*Blandfordia nobilis*) and Christmas bush (*Ceratopetalum gummiferum*), which were fairly plentiful in the gullies not far from the station; and also several other plants, including *Angophora cordata, Tristania neriifolia,* and many others. Quite a number of plants of the Gigantic Lily (*Doryanthes excelsa*) were seen, but the flowering season was past.

—E.C.

NOTES AND COMMENTS.

Artamus Superciliosus.—Last evening, 20th November, 1914, during a passing thunder storm at Strathfield, a large number of ants and other insects were swarming, and the air was full of the winged individuals, particularly of the large sugar ants (*Camponotus sp.*). The feast in the air thus offered attracted a large number of insectivorous birds, the majority of which were white-eyebrowed wood-swallows (*Artamus superciliosus*), which suddenly appeared in vast numbers, capturing the large-winged ants in the air, and generally alighting to devour their prizes. There was no mistaking the species of wood-swallow, as the white-eyebrow was very conspicuous. In half an hour's time there was not a wood swallow to be seen, and it would appear that the birds were migrating, and merely stayed for half an hour to refresh themselves "en passant."

Each year another wood-swallow (*A. sordidus*) arrives in this district and breeds, but I have not noticed *Artamus superciliosus* nesting here, though about Wagga numbers of the latter species arrive each year and hurriedly build their nests in tops of stumps and holes in posts, merely staying long enough to rear their nestlings and then passing on.

J. R. GARLAND.

Strathfield, 21st November, 1914.

P.S. (4th December).—I observe that many of the wood-swallows are still with us, but now in pairs, presumably, therefore, they mean to nest.

—J.R.G.

A seedling of *Viminaria denudata* was collected near Narrabeen on our last excursion. It shows reversion to the ancestral type. The mature plant is leafless, the long terete leaf-stalks doing the work ordinarily done by the leaf blade.

The leaflets present in the specimen are mostly simple, but in two instances there are trifoliate leaves. They vary in width greatly, some elliptical and others narrow—lanceolate.

The roots were plentifully supplied with root-nodules, a fact which I believe has not been previously recorded.

A. G. HAMILTON.

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The Naturalists' Society
OF NEW SOUTH WALES

ROYAL SOCIETY'S HOUSE, ELIZABETH STREET,
SYDNEY.

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The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages; and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

LIBRARY.

The Hon. Librarian is in attendance at the Library, Arts and Crafts Room, Norwich Chambers, Hunter Street, from 3 to 5 p.m., on Tuesdays. Members are invited to make use of the Library.

NOTICES.

MEETING, APRIL 12th, at 8 p.m.—Royal Society's Hall—
Discussion on: "Protective Coloration or Mimicry in Plants and Animals."

EASTER EXCURSION:—Details will be forwarded to Members.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

February 2nd, 1915.—The President, Mr. G. A. Waterhouse, B.Sc., F.E.S., occupied the chair, and about 42 members and visitors were present. On the recommendation of the Council, Professor H. M. Wheeler, Professor in Zoology, Harvard University, was elected an honorary member. Mr. G. Warry, Apiarist, Department of Agriculture, gave an interesting and instructive lecture on Bee-Keeping, illustrating his remarks with a fine series of lantern slides.

Abstracts from the following papers were read by the Hon. Secretary:—"Shrubs of the Western Plains," by Archdeacon F. E. Haviland, and "Notes on the Fauna and Flora of Deep Creek, Casino," by Miss F. M. Irby, both papers being illustrated by specimens. The President exhibited the early stages of *Eulepis sempronius;* Mr. A. A. Hamilton, *Senecio velleioides, Celmisia longifolia, Hibbertia pedunculata, H. serpyllifolia, Baeckea camphorata,* and *Claytonia Pickeringi,* with notes.

March 2nd, 1915.—Mr. H. E. Finckh presided, and 43 members and visitors were present.

The following were duly elected members:—Misses E. M. McNeill and L. Richards, Messrs. A. J. Weniger, G. Warry, and Denvers Powers.

An interesting lecture was given by Mr. E. Cheel on "Stictaceae, or so-called Lung-Worts." Miss Mabel Brewster exhibited specimens illustrating life histories of ladybirds, *Leis conformis,* and *Coccinella repanda;* Mr. E. H. Zeck, butterflies from Rabaul, collected by Mr. D. B. Carver, of Mosman; Mr. A. A. Hamilton, a series of plants, with notes; Mr. E. Cheel, a fine series of Stictaceae, in illustration of his lecture.

The Chairman alluded regretfully to the death of Mr. J. R. Garland, one of the oldest members of the Society.

NOTES ON THE FLORA AND FAUNA OF CASINO DISTRICT, NOVEMBER, 1914.

By Miss F. M. Irby.

In the brushes and along the banks of the creek there are still numbers of trees and creepers flowering; the delicate *Pithecolobium pruinosum* (Syn. *Albizzia pruinosa*) is a light feathery mass of buff and cream.

Early in the month the Brown Cedar (*Ehretia acuminata*) flowered. It is an insignificant little flower, borne in large drooping bunches; but when this tree gets its leaves (which it loses in the winter), it is one of the most handsome brush foliages. While the leaves are young it is nearly always attacked by various species of small beetles; they destroy the fresh shoots and flowers to such an extent that year after year it is almost impossible to find a bunch of berries. If they leave it alone it is a sight worth seeing about Christmas time, with its large grape-like bunches of tiny yellow berries.

Another insignificant little flower plentiful all along the edge of the water is the *Mallotus phillipinensis.* The Rufus fantail, *Rhipidura rufifrons,* loves this tree. In this district I have never found its wee cup nest on any other tree. Last spring we found four of these tiny cradles in one small patch of scrub, and all were built on Mallotus bushes; and the size and shape of the leaves, and the colour of the dead or withered ones, so resembled the nests that it would have been almost impossible to find them but for the excited movements of the nervous little owners.

There are still a few flowers on the Finger limes, *Citrus Australasica,* although most of the fruit is almost full-grown.

The handsome dark-green Scrub Crab-Apple, *Sideroxylon Australe,* is covered with small greenish-white flowers, and there is still ripe fruit hanging on the branches. The "Wild Wistaria," *Wistaria Maideniana* (Syn. *Milletia Maideniana*) is still flowering. The Bean trees, *Castanospermum australe,* are beautiful, not only the branches, but even the great thick stems, covered with the scarlet and yellow flowers. I have seen Bean trees grown about Sydney, but the trees looked mere dwarfed weeds, and the flowers were pallid parodies of the brilliant blossoms that deck our northern streams. The Leather-heads, *Philemon corniculatus,* love the Bean trees. Chattering and fighting, they hang in strange attitudes about the flowers, and sometimes there will be a young Koel, *Eudynamies cyanocephala,* with them (for here the Koels always seem to lay in the Leather-heads' nests), a great fat overgrown baby, quite old enough and capable of getting its own food, but too stupid and lazy to try; and this one sturdy infant, with its unceasing shriek for food, will make more din than all the Leather-heads and parrots put together.

It is curious to notice how some birds will return year after year to the same old nesting place. There was one old stump with two large white ants' nests on it, and for three years I noticed that each spring the lower nest was occupied by a pair of Sacred Kingfishers, *Halcyon sanctus,* while the upper story was taken by a pair of Laughing Jackasses, *Dacelo gigas.* One white-ants' nest was pointed out to me where a pair of beautiful little Macleay Kingfishers, *Halcyon Macleayi,* had reared families for four years; and there was a hollow spout just a little higher up the tree where a pair of Dollar birds, *Eurystomus Australis*, had been known to breed for the same number of years. Indeed, the Dollar birds are so fond of the same nesting hole that if anything happens to the tree they had been used to occupy, they will take possession of the nearest one possible to where it stood.

Some of the Willie-Wagtails, *Rhipidura tricolor,* appear to be of an economical turn of mind. I have seen them using the same nests as many as three times in one season, though never in the same place. They simply pull the nest to pieces and remove it gradually to another situation, sometimes so close to the old one that the casual observer wonders why they bothered to move at all.

In an out-of-the-way corner of the Tweed, early this month, the Maiden's Blush trees, *Echinocarpus australis* (Syn. *Sloanea australis*), were a most lovely sight, so many of them and such wonderful masses of bloom. In one spot, on the side of a very steep hill, the boughs, looking as though they'd been through a snow storm, with the whiteness of their flowers, hung downwards, mixing with the heaped-up mats of tree-fern that rose to meet them.

Sydney Harbour and the Blue Mountains may be soul-satisfying in their loveliness, and the vastness of Kosciusko takes one's breath away, but you want to sit and cry in the heart of a Tweed scrub, because it is beyond all understanding.

PLANTS THAT GO TO SLEEP, AND TWINING HABITS OF CERTAIN PLANTS IN PORT JACKSON).

(Abstract.)

By Edwin Cheel.

The phenomenon of leaf movement was observed as early as the days of Pliny, for we find records were made of certain movements of plant-life in his time.

Carl von Linné also observed that certain plants closed their flowers or folded their leaflets at night, and opened them in the morning at day-break; and his observations are published in his "Somnus Plantarum." Since Linnaeus published his work, many important memoirs have appeared, including such excellent works as those published by Charles Darwin, Pfeffer, Ulrich, and Sachs.

In the latter's works, plant movement is divided into three classes, namely, (1) periodic, automatic, or spontaneous; (2) those influenced by light and heat—the diurnal and nocturnal; and (3) those due to concussion or touch.

In the first class, such well-known plants as *Desmodium gyrans* may be grouped, which is quite familiar to a great number of plant-lovers.

In the second class we may group those plants which close their florets in the evening, such as the garden daisies.

The third group includes such plants as the familiar trigger-plants (*Stylidium* spp.), or "Ant Orchid" (*Caleana major*); and we may include the well-known sensitive plant (*Mimosa pudica*) in this latter group.

The opening of the flowers or unfolding of the leaflets in the morning, and the closing of same in the evening, such as we see in the "Native Yellow Wood Sorrel" (*Oxalis corniculatus*), is, without doubt, something very suggestive, if not representative of sleep, as to warrant the appellation of "sleep" and "waking."

The hour at which certain flowers close and re-open is so exact that "floral clocks" have in former days taken a prominent place.

We are told that Linnaeus formed one at Upsala, and attempts in imitation have on several occasions been made in Great Britain, with more or less success. The fact, however, of the closing is one thing, the explanation of it is quite another; and to this last we are endeavouring to obtain some information.

It is interesting to note that while a number of flowers close because of the removal of the stimulus of the solar light, many exhibit a total indifference to it. For example, to find the blue-rayed florets of the so-called "Oyster Plant" or "Salsify" (*Tragopogon porrifolius*) one must visit the neighbourhood of Flemington, or Moore Park, very early in the mrning, at least before ten or eleven o'clock in the morning, as the flowers are closed by noon, though the sun may be bright and shining; hence it has received the popular name in the old land of "Johnny-go-to-bed-at-noon."

Some few years ago, before the new Central Station was built, this introduced composite was quite common in the Devonshire Street Cemetery, and it is quite common on the railway embankments at Campbelltown.

If the various varieties of flowers are studied, it will be found that the phenomenon of the so-called "sleep" belongs less to external influences than to some peculiarity in the life-history or physiology of the plant.

Take for example the Native "Pig's Face" (*Mesembryanthemum aequilaterale*), found along our sea shores, together with the cultivated species, we find that the flowers do not expand until the sun is high up in the heavens—somewhere about noon.

It has been suggested that these probably require a certain intensity of light and heat. Some species, as, for instance, the introduced Scarlet or Purple Pimpernel (*Anagallis arvensis*), open and close with every change in the character of the sky.

The Evening Primrose (*Oenothera biennis*), which is common in certain parts of Port Jackson, and many of the cactus plants, such as the genus *Cereus*, cultivated in our gardens, open their petals in the evening.

In many plants, especially those which belong to the Pea family (*Leguminosae*), the leaves close towards evening and expand in daylight. For example, the various species of Medics (*Medicago* spp.) and Trefoils, or Clovers (*Trifolium* spp.), which are naturalised in the Port Jackson district, afford an interesting study.

Even in our private gardens a number of different plants can be examined, such, as for example, the cultivated Broad Bean (*Vicia Faba*) and the many forms of Lupins. If the leaves of the Broad Bean are examined on a crisp night it will be found that the leaflets tilt upwards and show the under-surface. In Lupins, the leaflets fold downwards, something like a half-closed umbrella.

The leaflets of *Tephrosia* also fold downwards, and it is interesting to note that the petiole droops also, so that the plants have the appearance of being wilted. In early morning the leaflets re-assume their ordinary position. This curious and engaging movement is no doubt dependent, in a great measure, upon the influence of the solar rays. There is something besides this, however, for we find by experiments that the leaflets of *Oxalis corniculatus,* growing in pots, kept in a warm room under a bright light, do not regain their normal day position until daylight appears. Last season I germinated some seeds of *Canavalia obtusifolia,* and I found that the first leaf above the thick fleshy cotyledons, which is simple, as well as the next leaf, which is trifoliolate, drooped in the evening after sunset to such an extent that the lamina or leaf-blade rested on the ground. Soon after sunrise the leaves assume their normal or day position again.

Many other Australian plants are worthy of special attention being paid to the movement of the leaves, with a view of adding to the list already recorded by Darwin and other writers, who have given special attention to several species. It has been observed by Darwin that plants asleep are in constant motion, due to no light relation, which he terms "Autonomous movements." "This," he says, "depends on innate causes, and are adaptive in Nature." He has recorded many experiments to show that the so-called sleep of plants is protective in its function. By pinning leaves of certain species of Oxalis in such a way as to prevent their folding up during the night, he also found that all so-treated were killed by cold. It has been repeatedly observed that leaves of sensitive plants fold up or drop when light becomes too intense. This is considered to afford protection to the plant, as the oblique angle to sun's rays prevents the over-illumination to a considerable degree, than if the paraheliotropic position were maintained.

(To be continued.)

SHRUBS OF THE WESTERN PLAINS.

Archdeacon F. E. Haviland.

The "Far West" of New South Wales has a charm of its own; and this is contributed to both by its flora and fauna, and certainly by the sense of infinitude, which the endless red and black, almost bare, plains strike into the thoughts of the traveller. There may be here and there a gentle rise and fall caused by the crumpling of the earth's surface, but scarcely sufficient to vary matters much.

Spotted about on these plains are some shrubs of more than passing interest. Here, for instance, is the "Wild Orange" tree, *Capparis Mitchelli,* L., which is really an ornamental shrub having symmetrical habits of growth, with attractive white flowers resembling small Magnolias; but so fugacious are the petals that it is impossible to secure intact specimens. The fruit grows in the manner of Capers at the end of a long gynophore, and attains to a diameter of a few inches; but the taste of the mesocarp is most pungent and "mustardy"; indeed, for the bravado of being able to say that "I have tasted it," I had to pay a penalty of a burning mouth for two days.

Here, too, we find the "Wild Lemon," *Canthium oleaefolium,* Hk., which, strange to say, does not produce lemons at all, or anything like them; but probably takes its vernacular from the semblance of its leaves. It has, however, good straight and strong stems, which should be of use for many purposes. The flowers are small, but in rather large and thick clusters. These "Oranges" and "Lemons" generally accompany each other all through the western bush lands. Then we may mention the "Leopard Wood Tree," *Flindersia maculosa,* F.v.M., which, by the variegated spots on the stem, lends beauty and contrast to the monotonous surroundings; but which, untrue to the traditions of its namesake, changes its spots every year. These "beauty spots" are caused by the thickening of the cambium, making the hide-bound bark to split off in places and expose new surfaces. They are of various colours—silvery-white, red, brown, yellow, faint-green. In season the branches are hanging down with heavy festoons of creamy flowers; while the fruits are of three-five valves, expanding starlike, and having a strongly muricated surface. The wood is easily worked and useful for carving purposes. I wonder if this tree could be brought in and domiciled as an ornamental shrub; though I do not remember seeing it grow anywhere but on slight ridges of the Devonian-quartzite formation. I only know the simple-leafed variety, though Bentham mentions also a pinnate-leafed form.

Next may be mentioned the "Warrior Bush," *Apophyllum anomalum*, F.v.M., which, done into English, is "A strange-looking leafless" bush, and well does it earn its name. Its branches, with only a pretence of leaves on them, stretching out like "the quills of a fretful porcupine," make, when bound up, good yard brooms. From the black berries it gets the name by the children of "The wild currant bush," though it is not the recognised "Currant Bush" of the interior, which is another very similar bush known as *Exocarpus aphylla,* a sister to our "Australian Cherry." The various "Hop Bushes" also deserve notice, if only from the fact that our early settlers, having been put about for hops wherewith to make their yeast, struck upon the successful idea of utilising the fruits of *Dodonaea viscosa,* L. and other forms, for that purpose. The bushes become literally covered with these three-four winged capsules about the size of a sixpence. These capsules are well adapted for distribution, as the wings, being circular and outspreading, are the better enabled to be caught in the wind and to be blown along the ground. On account of their bright colours, they are used for decorative purposes; yet the staminate flowers on dioecious bushes are insignificant, appearing like bunches of rust of a red colour.

There are also shady groves in parts of the "Pine Trees," *Callitris gracilis,* Baker, and *C. glauca*, R. Br., not *C. robusta,* as is so often mentioned, and which is a West Australian type, having much larger and more strongly marked fruits than our *C. glauca.* These Pines form a bold relief to the otherwise bare surroundings, but when they are isolated they impart a decidedly weird appearance to the country. When shedding their pollen-showers it is preferable to keep out of their precincts, for fear of hay-fever. The *C. gracilis* is the more graceful of the two trees mentioned, and has only been recorded from this district during the last few years. There are a few other pines of less note, though the most important, *C. calcarata,* R.Br., used so much for building purposes, is almost cut out of these parts. Any paper on this subject would be sadly incomplete without even a passing reference to our "Mulga Scrubs," *Acacia aneura,* F.v.M., which rank as the greatest stand-by of the fodder bushes. There are four kinds distinguished by their leaves, as "Long-broad," "Long-narrow," "Short-broad," and "Short-narrow" leafed. The habits of growth between the narrow and broad kinds are somewhat different; but other things being equal, the passing of these kinds into each other by such subtle gradations, renders their separation, even into distinct varieties, not to say species, a matter of impossibility from a Botanical point of view. They have spikes of yellow flowers of the Mimosae forms, and about one-half to an inch long. The narrow-leafed forms are especially responsible for the formation of "Mulga Balls," caused by the sheep eating the indigestible twigs and bark, which gather up into a series of balls of the size of a tea-cup in the podges of the sheep. Unfortunately, this valuable fodder shrub is being killed out in large patches on account of being infected with a gall, caused by a rust known as *Uromycladium Tepperi,* McAlpine. The wood of the Mulga is very attractive when worked up, especially in ornamental turnery, showing a pretty contrast between the dark brown xlyem and the creamy phloem. It has also the benefit of a scented odour.

Specimens submitted of—

Wild Orange: Leaves, Flowers, and Fruit.
Leopard Wood Tree: Leaves and fruit-capsules.
Warrior Bush: Fruits on branches.
Mulga Shrub: Rust-galls.

LIFE-HISTORY OF TEIA ANARTOIDES.

By L. Gallard.

This moth is common on the wattle about Sydney, and was described in the *Agricultural Gazette,* N.S.W., as an apple pest; also in Froggatt's Australian Insects, p. 255. The specimens described were bred from Quince trees.

Larva, brown, with brush-like tufts of hair on the back, and two tufts sticking up on the sides of the head.

The larvae, when feeding, draw the foliage together slightly with a silken web, forming a shelter in which, when fully developed, they pupate. The female is wingless, and, on emerging from her thin silken cocoon, she remains on the outside until she has laid all her eggs, and then dies. The male is about one inch across the outspread wings; body dark brown. Fore wings brown, marbled with black. Hind wings yellow in centre, with a wide black band around the edge. Antennae, feathered. These caterpillars almost defoliate Quince trees at times.

A sticky, strong-smelling Pimpla wasp parasitises numbers of the larvae.

Correction.—Australian Naturalist, January, 1915, p. 62, line 2 of Mr. Gallard's paper, for "imago," read "larva."

ON THE LARVAE OF MOTH.

NOLA METALLOPA AND SOME LARVA HABITS.

By C. H. Wickham.

These larvae feed on the leaves of Eucalyptus saplings. In the younger stages they eat only the fleshy part of the leaf and leave the veins. I have seen entire leaves with only the skeleton left, looking as if they had been skeletonised artificially. Their method is to feed side by side close together, heads all the one way, and to move backwards as the food is consumed. When half-grown they spread all over the plant and eat holes in the edges of the leaves. The most remarkable habit of this species is that, at each moult, they seem unable or do not want to get rid of the skin of the head along with that of the rest of the body. It—i.e., the head skin—remains firmly held by hairs on the dorsal surface of first segment, and at each succeeding moult it is raised by the last skin cast, which, of course, is larger than the previous one. So, in this way, after the fifth and last moult, the creature has a pyramid of five head-skins reducing in size to the top.

This is supported at the back by long hairs attached to the body. When the larva spins its cocoon, it utilises the body hairs, and the pyramid of skins is left on the outside. An incident that occurred in one of my jars lately goes to show how strongly hereditary instinct is bred into even caterpillars. Fourteen larvae of a species whose name is unknown to me, hatched from a batch of eggs found on a gum leaf. The leaf dried up, so I cut it all away except the part the eggs were on. As soon as I noticed the little larvae, I put a twig of gum tree with four or five leaves on it into a jar, and then shook the baby caterpillars all over it, also dropping in the bit of leaf with the egg shells and two of the larvae attached to it. In an hour or two I came back, and I found 12 larvae eating up the egg shells. Now, it is a habit of certain species to always eat up the egg shells before tackling any other food, and this was evidently one of these species, and the ten little chaps had found their way back to have their first meal—as their instinct bade them—off the shells, before starting on green food. I noted that the two that did not find the shells started eating the gum leaves without suffering any harm.

Another incident I think shows that caterpillars, especially those that live in communities, make signs to one another. I was away from home for a few days, and on returning, I heard a peculiar rasping and tapping sound proceeding from a jar containing about 30 caterpillars of the species *Ocinara lewinae.* On looking in, I found that they had eaten up all the food I had left them, and that some were clinging to the sides of the jar, and others to the dry stems, and every one was tapping vigorously with the head against that on which it happened to be. If they had only been on the twigs I would have thought they were trying to eat them; but this would hardly be the case with those on the glass; and it was strange that all should be doing it. Now, these larvae live together in a web, and move about in companies when food runs out. So I believe that this lot were signalling to one another that it was time to be off to another feeding ground.

NOTES AND COMMENTS.

INSECT-TRAPPING FLOWERS.—I was much interested in the information on this subject given by Mr. Steel, Australian Naturalist, Vol. II., p. 174. I examined my *Rhynchospermum* and found one Drone fly, *Eristalis tenax,* caught and dead on a flower. That was last year. It is now in flower again, and I have watched the flies, and also the common honey bees on it. Many of the flies were caught, but, after a struggle, all got free again. It was interesting to watch their efforts to escape, and it surprised me that they were not more injured in the struggle, for often the proboscis was twisted like a rope, and sometimes the head was also turned completely round.

After the release, however, they just stayed a few minutes combing out the proboscis, and then flew away. The time of imprisonment was usually from five to ten minutes. The longest time I noted was a little over ten minutes, and then release came in an unexpected way, just when I was beginning to think the fly was exhausted. Until then, it seemed to me that the best way was a straight pull over the centre; but release came when the fly had got down on the ovum and the proboscis was bent with a sharp curve between the petals. It may be that the legs of the fly are not long enough to exert the necessary force in the other position. I noted that none of the honey bee, *A. mellifica,* were ever held. This led me to examine the proboscis of both insects. The Drone flv has a very long proboscis, with a sort of hook at the end, which is not present on that of the bee; and this is evidently the reason why the fly is held and the bee not. The larvae of the Drone fly are those white larvae with long, rat-like tails, common in foul, stagnant water.

C. PHILLIPS FROST.

Kew, Melbourne,
28th Dec., 1913.

OBITUARY.

THE LATE J. R. GARLAND, M.A.—Towards the end of February of this year, our Society sustained a great loss by the death of our member Mr. J. R. Garland. Mr. Garland was one of the founders of the present Naturalists' Society, its first Hon. Treasurer, for some time a Vice-President, and during almost the whole existence of the Society a member of Council. Though on several occasions it was the desire of the members to elect him President, he could not be prevailed upon to accept the position. During the early days of the Society he was always ready with sound advice and assistance, and for several years the meetings of the Council were held at his office. He frequently brought most interesting exhibits and notes to our meetings, and was of material assistance to beginners at our excursions on account of his wide botanical knowledge: only in the previous part of this journal did he make a contribution to our Natural History knowledge. Towards the close of his long and useful life, he further showed his interest and sympathy with our Society by presenting us with his copies of the Proceedings of the Linnean Society of New South Wales. Our most sincere sympathies are extended to Mrs. Garland, who has generously presented to our library many valuable Natural History works possessed by our friend.

—G.A.W.

THE
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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

April 12th, 1915.—The President presiding, and about 38 members and visitors present.

Mr. and Mrs. H. M. Cox, Misses Boyd and McNamara, and Master C. Danvers-Power were elected members.

The President reported that Mrs. Garland had very kindly presented a valuable collection of books to the Society, including Bentham's *Flora Australiensis,* a list of which would in due course be published in the "Naturalist." A hearty vote of thanks to Mrs. Garland for her generosity was carried by acclamation. Letters were received from Mrs. Garland, thanking the members of the Society for their expressions of sympathy, and from Professor W. M. Wheeler, of Harvard University, thanking the Society for his election as an Honorary Member.

The President extended a hearty welcome to Mr. G. Lyell, of Geelong, who was present at the meeting.

The business of the evening was a discussion on "Protective and Attractive Mimicry in Plants and Animals." The following members contributed notes and exhibited specimens:—The President, Miss Froggatt, Messrs. Froggatt, Wickham, A. S. le Soüef, A. A. Hamilton, and Cheel.

The other exhibits were:—Miss McAnene, "Lace-ball Fungus" (*Clathrus cibarius* var *gracilis*); Mr. A. A. Hamilton, botanical specimens with remarks; Archdeacon F. E. Haviland, a series of micro-photographs of pollen, algae, etc.

May 4th, 1915.—The President presiding, and 27 members and visitors present.

The President welcomed back Mr. D. G. Stead, F.L.S., on his return from his official visit to Europe as State Fisheries Commissioner.

Mr. C. Thackery gave a lecture entitled, "A Naturalist Among Fishes," illustrated with lantern slides.

Miss Sulman exhibited a native basket from Warrnambool, Vict., and photographs of Australian Wild Flowers; Mr. Stead a walking-stick made from the stalk of a gigantic sea-weed; Mr. Zeck, a photograph of the celebrated naturalist, John Henry Fabre, at the age of 90.

The following were duly elected members:—Misses Steinbeck, Holmes, Williams, and Hill; Messrs. F. C. Jackson, B.Sc., K. C. McKeown, and B. Harrison.

June 1st, 1915.—The President presiding, and 78 members and visitors present.

The President reported the death of Sergeant Oscar A. Rainbow, in action at Gallipoli. A resolution was passed that a letter be sent to Mr. and Mrs. W. J. Rainbow, expressing the heartfelt sympathy of the members.

The President also announced that Sergeant C. F. Laserson, one of our members, and also a son of Mr. C. F. White, had been wounded at the front.

Misses Durrant and Venalter and Mr. J. Roberts were elected members.

Mr. C. Hedley, F.L.S., gave an extremely interesting lecture, entitled "Life on the Sydney Beaches."

Mr. E. Cheel exhibited, on behalf of Miss Irby, a number of interesting botanical specimens and sketches; Mr. A. A. Hamilton, botanical specimens; and Mr. W. W. Froggatt, scarab beetles from West Australia.

MISCELLANEOUS BOTANICAL NOTES.

By A. A. Hamilton.

Correa alba, Andr.—A salt-loving (*halophilus*) plant with decided *xerophytic* proclivities, necessitated by its environment. The fierce rays of the sun striking the beach sand create a heated atmosphere favourable to acute transpiration. To mitigate the evil effects resulting from this condition, the plant has varnished the upper surface of its leaves, with the object of deflecting the powerful rays of the sun, thereby preventing too rapid evaporation; and covered the branches and underside of the leaves with a close vestiture, which is serviceable in protecting the breathing appliances (*stomata*) from being choked by the drifting sand, and in conjunction with the highly-polished upper surface and leathery consistence of the leaves becomes one of a redoubtable trio of protective agencies against the otherwise destructive assaults of the sharp-edged, storm-driven sand grains. This species may be readily separated from other members of the genus in New South Wales by its characteristic bell-shaped (*campanulate*) corolla, the petals of which are free, as opposed to the coherent petals and tubular corolla adopted by its State kinsfolk. It grows freely from seeds, and if given a sandy soil, will flourish at some distance from the sea-shore. It was noted that when not subjected to the rigorous conditions obtaining on the beach, but enjoying the comparatively luxurious surroundings of the garden, it displayed a grateful appreciation of the change by lifting its head and opening out its branches, in marked contrast to the harassed, browbeaten appearance evinced by the crowded foliage and stunted habit which characterise the plant in its natural environment.

Grevillea Gaudichaudi, R. Br.—A very rare species confined to the higher altitudes of the Blue Mountains. The writer has only seen two plants, one in a gully at Leura, near Gordon Falls, the other about five hundred yards from Katoomba, on the Minnie Ha Ha Road, where, unfortunately, it is in imminent danger of destruction by the wheels of passing vehicles. In the latter situation it was collected in the company of the late Mr. W. Forsyth, one of the earliest members of the original Society. Two efforts have been made at its cultivation. The Leura plant was lifted "With a Ball," conveyed to Sydney, and there planted. It lingered for a brief season and passed away. The second attempt was made with seeds, of which two only were obtained; one of these was sown in the Autumn, the other being reserved until the following spring. The precautionary measure was unavailing, as the seeds in each case, though fully developed, failed to germinate. This species was brought under the notice of the members of the Linnean Society, New South Wales, some three years ago by the Secretary, Mr. J. J. Fletcher, M.A., B.Sc., who suggested that it was a case of natural hybridism, *G. acanthifolia*, Cunn × *G. laurifolia*, Sieb. At a later meeting of that Society, Mr. Fletcher supplemented his earlier remarks with a considerable amount of evidence, collected during the period intervening, in favour of his deduction.

The question of natural hybridism has attracted a considerable amount of attention from taxonomic botanists, whose work would be materially affected by such a contingency, and it behoves them to carefully note any evidence either for or against its acceptance.

(To be Continued.)

THE LIFE HISTORY OF LADYBIRDS.

By Miss Mabel Brewster.

On looking at a tree at our home one morning, I noticed it was covered with aphis, so knew in a very short time the ladybird, *Leis conformis*, would appear. I watched, and was rewarded in a couple of days by two ladybirds appearing on one of the twigs. I therefore put them into a box, and next morning found they had laid a number of tiny yellow eggs. So I put the ladybirds back again on the tree and watched the eggs. The eggs were laid on February 5th, and on February 6th they hatched. The small larvae were quite black all over, but on changing the first skin, February 11th, had a yellow marking on seventh segment. As they are such hungry little mortals, I put into their box several twigs covered with aphis, and it was very fascinating to see the way they attacked the aphis. I put some aphis right close to them, but no, Mr. Larva would not look at them; he would much rather hunt and catch them himself. So off he started, and with his two front legs caught and held the aphis from behind, and began sucking the juice from it, then calmly pushed it aside and went after another, and so on. In a very short time they had all the aphis eaten, and I could not get more for them.

The ladybirds out in the garden had worked so hard, the aphis there also met the same fate, so I had to resort to other means for food. Last year I worked out life-history of *Leis conformis* on orange and mandarin. I could not get these fruits, so tried peach and pear juice, which they took to very kindly. On February 14th they changed their second skin, and I noticed they were not quite so black, and had yellow markings on fourth and seventh segment, also along side of body almost from head to tail.

After feeding for two days they attached themselves to side of box, head downwards, and pupated on February 16th. They hatched out on 21st February by breaking the pupal skin. When newly hatched they were quite yellow, and in a very short time you could see the little black spots appearing, and in about half an hour they were perfectly black.

Two days after I caught the *Leis conformis* I found two of *Coccinella repanda,* and put these into a box, where they laid eggs on February 6th, and hatched on February 10th. But the larvae were yellow little creatures at first, and as the day went by became black. After changing the first skin, February 13th, they had a broad yellow transverse band on second segment, on third two short transeve orange bars, and running down from between these a longitudinal yellow band. The anal segment was yellow, also slight yellow marking on outer edge of body. (They thus differ from larvae of *Leis conformis,* which has two broad yellow or orange bands on body, also at side of body.) These little larvae, on changing their second skin, were a dull red brick colour, and in three days pupated, February 19th. On February 24th the back of pupal skins slit open and out stepped the ladybirds. They were at first yellow, then the black marking instead of spots appeared, and in about an hour the ladybirds were ready to fly. I am also working out the Pest Ladybird,'' 28-punctata.

NOTES ON THE FAUNA AND FLORA OF DEEP CREEK, CASINO, DECEMBER, 1914, AND JANUARY, 1915.

By Miss F. M. Irby.

The small-leaved Kurrajong, *Commersonia echinata,* is in flower; the flat-spreading boughs, like giant wedding bouquets heaped one above the other, their flowering period lasts longer than that of most bush trees. Frequently there are tiny beetles, green as emeralds, hidden in the flowers, and sometimes big grey beetles, with very long antennae, lie hidden against the branches; but they are so much like the bark that they are hard to find.

There is another tree with thick bunches of small white blossoms flowering now, but I do not know its name;

and a handsome shrub (I've seen it in gardens) is bright with its handsome, red flower-like calyx.

The shining yellow berries of the brown cedar, *Ehretia acuminata,* are hanging in ripened clusters; it is curious that no matter how plentiful these berries are the birds do not seem to eat them.

The hard, yellowish-green berries of the native elm, *Apananthe philippinensis,* are ripe also. Lewis' honey-eaters love this uninteresting-looking little fruit, so do the beautiful Regent birds, *Sericulus melinus.* Some years ago we were living on the edge of a scrub where there were a great number of these beautiful birds. There were some large native elm trees only a few feet from the back door, and I used to watch the birds devouring the berries; they built a bower there, only a few steps away from the house, just inside the scrub, in one of the few coarse grass tussocks that grew there. The centre was scraped away and flattened, and the grass at either side bent over to form the bower; the ground around it was cleared, and a few land shells and coloured leaves scattered about.

In the larger scrubs the white wax-creeper, or *Hoya,* is in flower, so are the beautiful scrub orchids (*Calanthe veratrifolia*). I have seen these lovely white orchids growing to perfection in the thick scrub on the banks of Evans River, where they could be picked literally in hundreds. They are easily cultivated, simply requiring to be placed in a damp, shady situation, similar to that suitable for ferns. They are wonderful flowers for lasting. Some I have growing have now been in flower for six weeks, and are still quite fresh.

On some of the wild grape vines there have been large fawn-coloured grubs with darker brown markings; they mostly keep high up, and are night feeders. I suppose they must belong to some kind of hawk moth.

There have been beautiful caterpillars feeding on the small plants of Black Wattle (*Acacia decurrens* var *pauciglandulosa*); they are striking-looking, with their alternates stripes of green and yellow; the pupae are pale green, with wavy white markings. With finely-spun silk, they weave some of the leaves into a resting place. I kept one grub for a week on Cootamundra Wattle (*Acacia Baileyana*) leaves, which it eat readily, but the pupa is smaller, and of a lighter colour than those fed on their proper food plant. I supposed they must be the larvae of the Tailed Emperor butterfly, *Eulepis sempronius.*

On hot summer nights we sometimes see solitary specimens of Black and White Bats, *Taphazons flaviventris,* but you need to be familiar with their note, for they usually fly so high that unless you heard them you would be unlikely to notice them at all. Although I have only seen them fly singly at night, they always seem to live together in small colonies in the daytime, far in the hollow spout of a tree. They are beautiful little creatures, smooth and soft as the richest velvet, with black backs and snow-white breasts.

In one family of five, which I once procured (and kept under a dish-cover to paint), two had breasts of a delicate yellow. As they were exactly like all the others which I had seen in every other respect, I thought it possible that they might be young ones.

One of the black and white ones had had its wing hurt, and I kept it for a long while. I could not find out what sort of insects it cared for, so I fed it like a young "'possum" on bread dipped in sugar and milk, a mixture it seemed quite fond of. When moving it did not seem to use its eyes, but felt its way with the tips of its folded wings, and when moving from place to place, or when climbing to my shoulder, always moved backwards.

If hurt or frightened, or even when cold, these bats would utter a loud cry, but the ordinary note is not unlike the twittering of swallows. But it had not much gratitude, for in spite of its seeming tameness, it suddenly discovered one evening that it once more had the use of its wings, and flew off without a moment's warning.

Some time later I had another one, which I hoped to tame, but was going to Sydney just then, and thought no one would care to look after it, so I let it go. It flew off readily, darting higher and higher in everwidening circles until lost in the gathering darkness of the evening sky.

ENTOMOLOGICAL NOTES.

By L. Gallard.

Paropsis variolosa is of a yellowish brown colour, thickly speckled with pale yellow, the male resembling the *Coccinellidae* in shape, but being over twice the size of the common English Ladybird (*Leis conformis*), and slightly more elongate. The female is often almost twice the size of the male, and still more elongate. The eggs are rough, elongate, dull yellow in colour, attached on end in clusters, wholly encircling the young shoots of *Eucalyptus*, upon which the young larvae feed. The newly-emerged larvae are white, with black heads, and feed gregariously. The older larvae, however, feed singly, and when full-grown are ⅝ to ¾ of an inch long, dull cream in colour, with a large black spot on the first thoracic segment, from which a widening and darkening dorsal dark band runs backwards. There are six lateral spots, and the head is black. The larvae pupate beneath the soil. All stages may be commonly found on young eucalypts during November.

Galleruca semipullata (Figleaf Beetle) is of a smoky-brown colour, elongate in form, measuring about half-inch; the elytra are very flimsy. The eggs are dull brown, rough, and elongate, and are laid in patches up to the size of a threepenny piece in the fig leaves. The very young larvae are dull brown, and feed gregariously until about half-grown. As well as feeding on wild figs, they do considerable damage in the orchard, even attacking the young figs. They pupate beneath the soil.

Oedonestis australasiae is a thick-set moth with rather a heavy body. It is about 1½ inches in expanse, and of a dark fawn colour, the forewings being slightly marked, the hindwings unmarked. The palpi are very long and conspicuous. The specimen exhibited was bred from a larva found at Ryde on September 11th, 1914, feeding on *Acacia longifolia*. It pupated on September 17th. The imago emerged on October 9th. The larva is 1½ inches long, light grey tinged with pink, and has a dorsal row of nine round purple blotches. The ventral surface is flat, the sides being much extended and covered with hairs; and so the larva is very difficult to detect when at rest, with its hairy flange-like sides and cryptic markings, which resemble the bark of its food plant. The pupa is enclosed in a light silken cocoon amongst the leaves of the food plant.

Cacaccia post-vittana.—A female of this species laid over 200 small flat blob-shaped eggs, resembling those of the Codlin Moth, but laid in clusters. The eggs hatched in eight or nine days. The larvae of this species feed on the tops of the young shoots of apple trees, and on growing older, draw the sides of a leaf together as a shelter. At times they eat holes in the green apples.

EASTER EXCURSION: TUGGERAH LAKES.

Twenty-seven members of our Society spent the Easter holidays at Tuggerah Lakes entrance. Suitable accommodation was obtained at one of the boarding houses, and altogether, an enjoyable time was spent. No very serious excursions were undertaken, but each morning and afternoon rambles were made through the neighbourhood for botanical and entomological specimens. A boating trip was taken on the lake on one afternoon, and the ladies showed an equal skill in the use of the sculls to the men. We were able to get a closer view of the pelicans and an immense flock of black swans. On another afternoon a launch trip was not so successful, and we had to return owing to the driving rain Two members eager for night feeding Lycaenid larvae, returned at 10 p.m. in the pouring rain. Other than this, rain interfered but slightly with the trip.

The thanks of the members were specially conveyed to Mr. Wickham for the arrangements he had made, and for his management, which greatly helped to make the trip a success.

The botanists were indebted to Mr. A. A. Hamilton for identifying the plants collected. for leading the botanical excursions, and for supplying many interesting facts about the plants. One afternoon was devoted to a talk about the plants collected, and an examination of them. Mr. Hamilton reports that the flora proved to be much the same as that of the beach flora from the lakes south to Port Jackson, with a few outlying plants from the Northern Brush Forests, the rarest being a straggling composite, *Eclipta platyglossa.* On the flats near the lake the mistletoe, *Loranthus linophyllus,* was found parasitic upon the swamp oak, *Casuarina glauca,* and upon the mistletoe a further parasite, *Notothixos incanus* var *subaureus. Dendrobium teretifolium*, the Pencil Orchid, was also found upon the *Casuarina.* An individual plant of a prostate geebung, *Persoonia chamaepence,* rarely found in the coastal area, was also noted.

Two important butterfly life-histories were obtained. The small green larvae of *Neolucia serpentata* were found feeding upon the saline plant *Rhagodia billardiera.* When the *Loranthus linophyllus* was noticed on the swamp oaks we hoped to find some stages in the life-history of an *Ogyris.* Soon many of these butterflies were seen flying far out of reach round the tops of the oaks. At last Mrs. Cox, of our party, noticed a specimen settle low down; this was speedily netted by the President, and proved to be a fine female of *Ogyris amaryllis amaryllis,* not previously recorded from south of the Richmond River. Our member, Mr. Roberts, was good enough to fell several of the oaks containing mistletoe, but it was only a few hours before leaving that we were able to find any larvae or pupae. Several of both were fortunately obtained, and to date, two fine butterflies have emerged, and there are still three pupae, which it is hoped will produce further specimens of this uncommon butterfly.

—G.A.W.

—A.A.H.

EXCURSION TO OATLEY BAY, MAY, 1915.

About 33 members attended this excursion, under the leadership of Mr E. Cheel.

The weather was all that could be desired, and about two hours were spent collecting plants and insects on the rocky shores skirting the bay.

About 32 species of plants were collected in flower or fruit, including *Styphelia laeta,* which is not very common near the bay, but is more plentiful towards Peakhurst. A search was made for *Cladium mariscus,* which was collected in this neighbourhood about eight years ago by Mr. Cheel, but on this occasion the plants could not be found, owing to the land being occupied for residential purposes.

A fine lot of *Callitris Muelleri* was seen, as well as several plants of the green-flowering form of *Correa speciosa* var *viridiflora.*

Some interesting fungi were also collected, including *Amanitopsis pulchella,* a very pretty agaric, and *Polysaccum pisocarpium.*

—E.C.

OUR ROLL OF HONOR.

Amongst the names of the heroes who have fallen in the field of battle, fighting for us and for the cause of righteousness and justice, occurs that of Sergeant Oscar A. Rainbow, second son of our friend and colleague, Mr. W. J. Rainbow and Mrs. Rainbow, who was killed in action at the Dardanelles on May 24th.

Our deepest sympathy goes out to the stricken parents, and we offer our tribute of gratitude, admiration, and respect to the memory of their brave son.

As announced by the President at last meeting, our fellow member, Sergeant Laseron, and a son of Mr C. J. White have been wounded at the front. All of us wish them a speedy recovery and return to the scene of action.

THE LATE MR. F. MAUSON BAILEY.

Just as we go to press we note with regret the death of Mr. F. Mauson Bailey, the veteran Queensland botanist, in his 89th year.

NOTES AND COMMENTS.

The Range of a Sea Bird.—One of our members (Mr. E. J. Bickford), during a voyage from Brisbane, caught a Petrel, which flew on board the ship, and sent it to me for identification. It proved to be Wilson's Storm Petrel (*Oceanites oceanicus*). This handsome little bird, no larger than a swift, has wings wonderfully adapted for flight. It is called in Lucas and le Souef's "Birds of Australia" the Yellow-Webbed Storm Petrel, and its range is given as over the Southern and Pacific Oceans to the coast of Labrador, in the Atlantic. Mr. Bassett-Hull, to whom I gave the specimen, informs me that members of the Mawson Antarctic Expedition found it breeding in Adelie Land.

—Walter W. Froggatt.

LIST OF BOOKS PRESENTED BY MRS. GARLAND AND THE LATE MR. GARLAND TO THE LIBRARY.

"Coloured Plates of English Wild Flowers, with Descriptions." "Flora Australiensis," 7 vols., Bentham. "Birds of Australia," 6 vols., Broinowski. "Polar and Tropical Worlds," Hartwig. "Handbook of the Flora of New South Wales," Moore. "Natural System of Botany," Lindley. "Ferns of Great Britain and Their Allies," Pratt Anne. "Botanical Dictionary," Paxton. "Australian Insects," Froggatt. "American Journal of Microscopy," 2 vols. "Manual of Microscopic Mounting," Martin. "Earth and Sea," Figuier. "Australian Orchids," Parts 1, 2, and 3, Fitzgerald. "Mammals of Australia," Krefft. "List of Plants in Neighbourhood of Sydney," Woolls. "Handbook for Australasian Association, 1888." "Key to the System of Victorian Plants," 1 and 2, Von Müeller. "Text-Book of Botany," Murch. "The Plants of New South Wales," Woolls. "List of Australian Birds," Ramsay. "Handbook of Ferns," Lyell. "British Marine Conchology," Thorpe. "Introduction to Botanic Teachings," Von Müeller. "Proceedings of the Linnean Society of New South Wales." Complete set (several duplicates) from Vol V., "Macleay Memorial Volume."

Vol. III.—Part 8. October, 1915.

THE

Australian Naturalist

JOURNAL AND MAGAZINE

—OF—

The Naturalists' Society of New South Wales.

PUBLISHED OCTOBER 5th, 1915.

Edited by Thos. Steel, F.L.S.

The Author of each Article is responsible for the Statements and Opinions expressed therein.

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Price: SIXPENCE.

(ISSUED QUARTERLY.)

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The F. Clark Printing House, 3 Rowe Street.
1915.

The Naturalists' Society
OF NEW SOUTH WALES

ROYAL SOCIETY'S HOUSE, ELIZABETH STREET,
SYDNEY.

Office Bearers, 1914-1915.

President—W. W. Froggatt, F.L.S., F.E.S.

Vice-Presidents—A. G. Hamilton ; G. A. Waterhouse, B.Sc., B.E., F.E.S. ; Miss F. Sulman.

Hon. Treasurer—H. E. Finckh, 100 Raglan Street, Mosman.

Hon. Secretary—D. W. C. Shiress, Box 2178 G.P.O., Sydney.

Hon. Editor—T. Steel, F.L.S., c/o Colonial Sugar Refining Co., Ltd., 1 O'Connell Street, Sydney.

Hon. Librarian—C. H. Wickham. *Hon. Lanternist*—C. J. White.

Other Members of Council—Miss A. Brewster ; Miss C. M. le Plastrier F. W. Carpenter, M.A. ; E. Cheel ; E. S. Edwards, M.A. ; W. J. Rainbow, F.E.S. ; D. G. Stead, F.L.S. ; A. A. Hamilton.

Publication Committee—The President ; Hon. Editor ; G. A. Waterhouse.

The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

LIBRARY.

The Hon. Librarian is in attendance at the Library, Arts and Crafts Room, Norwich Chambers, Hunter Street, from 3 to 5 p.m., on Tuesdays. Members are invited to make use of the Library.

NOTICES.

MEETING, OCT. 5th, at 8 p.m.—Royal Society's Hall—
"The Physical Side of Osmosis," by F. W. Carpenter, M.A.

EXCURSION, OCT. 9th—Kitty's Creek, Lane Cove River—
Leader, Mr. WICKHAM.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE

Australian Naturalist.

VOL. III. OCTOBER 5, 1915. PART 8.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE NATURALISTS' SOCIETY OF NEW SOUTH WALES.

Sydney,
18th August, 1915.

I take this opportunity to remind you that the annual subscription to the Society is now due, and payable to the Hon. Treasurer, Mr. H. E. Finckh, "Hermes," Raglan Street, Mosman; also at the same time to ask your hearty co-operation to secure new members.

Our roll-call is 200, and we want to double this figure during the year, and to do this all you have to do is to bring along one new member. If you can influence more, do so, for your interest in the progress of the Society is desired above all things.

It has been the wish of your Council to increase the size of *The Naturalist,* and, if possible, to double it, but owing to the lack of necessary funds, this has hitherto been beyond them. I now appeal to the members to make it possible to do this by introducing new members, and thus provide the means to make *The Naturalist,* if anything, more attractive and useful. At the present time, otherwise useful matter has to be cut out of the journal owing to want of space, and the paper is intended to be, and should be, a record of field work and observations by the members.

The Council has further decided to alter the routine of the monthly meetings by making a "Members' Hour," so that for the future, business will commence at 7.45 p.m., and after its disposal exhibits will be taken. Then the lecture will follow at 8.30 p.m.

In connection with exhibits, I would ask members to hand me their notes, so that a record may be made in *The Naturalist.*

D. W. C. SHIRESS,
Hon. Secretary.

ORDINARY MEETING.

6th July, 1915.—Mr. G. A. Waterhouse, F.E.S., President, in the chair, and about 49 members and visitors present.

The President reported that the prizes for the Botanical and Entomological essays had been awarded to Miss F. M. Irby and Mr. L. Gallard, respectively.

Mr. Bassett Hull gave an interesting and instructive paper on "The Petrels of Australian Seas," illustrating his remarks by a splendid exhibit of skins and eggs.

Mr. Danvers Power exhibited Fishing Appliances from Ocean and Pleasant Islands, and offered interesting remarks thereon; Miss Sulman, native orchids, *Corysanthes pruinosa* and *Pterostylus;* Miss le Plastrier, fungi from Casino; and Miss Steinbech, a shell carved by the late Sir Henry Parkes.

Messrs. A. S. le Soüef and Mr. A. A. Hamilton were elected Auditors for the year.

ANNUAL MEETING.

3rd August, 1915.—Mr. G. A. Waterhouse, President, in the chair, and about 49 members and visitors present.

The Annual Report of the Council was read by Mr. Cheel, and adopted. Mr. Finckh submitted the Annual Financial Statement, which was also adopted. Election of Officers, as set out on page ii., was confirmed. The President delivered the Presidential Address, taking for his subject, "Some Natural History Reminiscences."

Mr. Froggatt, having been duly elected President, Mr. Waterhouse tendered him the congratulations of the Society, and Mr. Froggatt returned thanks for the honour conferred on him. Mr. Edwards proposed hearty votes of thanks to the retiring President, the Hon. Treasurer, and Hon. Editor of *The Australian Naturalist*, which were carried by acclamation. Mr. Cheel, having been compelled, through pressure of official duties, to resign the position of Hon. Secretary, Mr. A. G. Hamilton referred in feeling terms to the work done by him during his long term of official connection with the Society as a member of

Council, President, and Secretary. Mr. Cheel had relinquished the Secretaryship through pressure of work, and he knew he voiced the feeling of each member of the Society in thanking him on their behalf for his unfailing courtesy, his generous help, and unstinted devotion during many years. Messrs. Finckh, Waterhouse, and Edwards also testified to their sense of the value of Mr. Cheel's services. A cordial vote of thanks was carried by acclamation.

ORDINARY MEETING.

September 7, 1915.—Mr. W. W. Froggatt, F.E.S., F.L.S., President, in the chair, and about 40 members and visitors present.

Mr. L. Gallard gave excerpts from his prize essay on "Insects associated with *Acacia decurrens*," illustrated with most carefully prepared specimens. Mr. Gallard's remarks were highly instructive, and gave much information on the life-history of both useful and destructive insects which frequent this tree. An interesting exhibit was a live long-tailed wasp, *Megalyra shuchardi*, with an ovipositor three inches long, which is used by the insect for reaching the wood-boring larvæ of longicorn beetles. A pleasing feature of the meeting was the introduction of a "Members' Hour," in which a large number of exhibits were discussed. Amongst these were a "Punk" Fungus, exhibited by the President, who explained how the Aborigines use it to carry fire about with them. Mr. Beckford, a *Cymbidium*, from Siam; Mr. Carter, a couple of beetles from the fighting line in Gallipoli, collected by his son, Captain Carter; Mr. Zeck, a geranium, with a leaf showing marginal cohesion; Mr. A. A. Hamilton, Filmy Ferns, representing the New South Wales members of the genus Trichomanes, also a series of mounted specimens of interesting plants; Mr. Shiress, *Tetratheca thymifolia* var *alba* and *Boronia Fraseri*, from Hornsby; Mr. Wickham, caterpillar and cocoons of *Nola metallopa;* and Miss le Plastrier, *Dichondra repens.*

Mr. A. A. Hamilton read a paper on *Callistemon lanceolatus.*

The President announced the resignation of Mr. W. M. Carne from the Council, owing to his having volunteered for the fighting line, and its selection of Mr. A.

A. Hamilton to the vacant position. A special vote of sympathy to Mrs. Horan, whose husband—an old member of the Society—was recently killed at Gallipoli, was moved by Mr. Wickham, and seconded by the President.

ANNUAL REPORT.

The Council has much pleasure in submitting the third Annual Report of the Society for the year ending 31st July, 1915. The year commenced with an event of special interest to many of our members, the visit to Sydney in August last of members of the British Association for the Advancement of Science. Several of our members had the pleasure of renewing their acquaintance with fellow-workers whom they had met in the old land, whilst in other instances new friends were made.

It was indeed a very great pleasure to be able to pilot our oversea visitors to some of our best Nature Study spots, and we hope that the visit to these shores will prove to be profitable from a scientific point of view to our visitors.

It was extremely unfortunate that the crash of arms in Europe commenced just on the eve of the arrival of our visiting scientists, as the plans and earlier arrangements were to a certain extent interfered with.

During the year 33 new members have been elected, whilst 36 have formally resigned. In addition to those who have formally tendered their resignations, we have to record the loss of 10 other members from our list of membership, owing to their subscriptions being unpaid, or having removed without furnishing their new address.

It is with deep regret that we record the deaths of three members, including the late Mr. J. R. Garland, to whom reference has already been made in the Society's journal, as well as Mr. A. Searle and Mr. D. C. White.

It will be seen from the above that our membership has been reduced by 16 members.

The ordinary monthly meetings have been well attended, and it is satisfactory to note that there has been an average attendance of fifty-four at the meetings. The lectures or papers read at the meetings have been instructive, and have dealt with various branches of Nature

NATIONAL HERBARIUM

Study, as will be seen by the following list of subjects, a summary of which has for the most part already appeared in the Society's journal.

The following is a list of the lectures given or papers read at the meetings:—

September.—Notes on the Flora of Port Jackson, by Miss F. Sulman and Messrs. A. A. Hamilton and E. Cheel.

October.— 'Bird Notes,'' by Dr. E. A. D'Ombrain.

November.—Geology of the County of Cumberland, by J. E. Carne, F.G.S.

December.—'On Ants,'' by Professor Wheeler.

February.—Open Night.

March.—"Stictaceæ,'' or so-called Lungworts, by E. Cheel.

April.—Discussion on Protective and Attractive Mimicry in Plants and Animals, by various members.

May.—"A Naturalist Among Fishes,'' by C. Thackeray.

June.—"Life on the Sydney Beaches'' (Marine Oecology), by C. Hedley, F.L.S.

July.—"The Petrels of Australian Seas,'' by A. F. Bassett Hull.

We are deeply indebted to the above ladies and gentlemen, to whom the Council begs to express its thanks.

The exhibits at the meetings have been specially interesting and instructive, and in several instances valuable notes concerning them have been published in the journal. Although many useful notes have appeared in the journal, there is still room for further progress in this direction, and it is the Council's sincere wish to have the journal enlarged, so as to provide more space for real Natural History Notes.

The Monthly Excursions have been well patronised and some specially interesting localities have been visited, including Lane Cove, Heathcote, Killara, Collaroy Beach, Tuggerah Lakes, Oatley Bay, Long Bay, and Pymble.

The library has been considerably augmented during the year by the receipt of quite a number of valuable books and pamphlets obtained by way of exchange, as well as by donations received from the late Mr. Garland and Mrs. Garland. The Hon. Librarian (Mr. C. H. Wickham) has now completed the arrangement of these works, and reports that several members have availed themselves of the use of the library during the year, and that there is every reason to believe that members will appreciate its use when it is better known.

Our little journal, *The Australian Naturalist,* has been issued each quarter, and the thanks of the Council are due to the Hon. Editor (Mr. T. Steel, F.L.S.). The journal is much appreciated by the members and other lovers of Natural History.

During the year two prizes were offered for essays on botanical and entomological subjects, by Mr. E. Bickford and our President (Mr. G. A. Waterhouse, B.Sc., B.E., F.E.S.), which resulted in four members responding. The prize for the botanical essay on "Climbing Methods of Plants" was awarded by Mr. Bickford to Miss F. M. Irby, and the prize for the best essay on "The Insects Associated with *Acacia decurrens,*" by Mr. Waterhouse, was awarded to Mr. L. Gallard.

The finances of the Society are in a very creditable state, considering the critical conditions caused by the war, and our thanks are due to the Hon. Treasurer (Mr. H. E. Finckh), who has so ably looked after our interests in this important direction.

At the present time the Council is making an endeavour to obtain the use of a room for our meetings in the new building now in course of erection for the Department of Public Instruction.

The correspondence received in reply to the request made by the Council seems, so far, to be fairly satisfactory, and if eventually successful, we are hopeful that the heavy expenses at present incurred in renting rooms for our meetings will be utilised in increasing the size of the journal.

PRESIDENTIAL ADDRESS.

"SOME NATURAL HISTORY REMINISCENCES."

By G. A. Waterhouse, B.Sc., B.E., F.E.S.

(Abstract.)

I propose, first of all, to give you a short account of the earlier operations of this Society and its forerunners, that I hope will not weary you, and make some comparisons with the time, eight years ago, when I previously occupied a similar position to that I am occupying tonight.

Though having no personal knowledge, I believe the first Field Naturalists' Society was one called the Natural History Association of New South Wales, conducted in connection with the Sydney School of Arts. Probably only one or two of our members belonged to that Association, which afterwards grew into the Field Naturalists' Society of New South Wales. With this Society I have more, and a personal knowledge, and several of our own prominent members were also members. This Society used to meet at the School of Arts, and for a time did very useful field work, though it did not undertake any publication. It met regularly every month and held excursions nearly every fortnight, though the attendance at these was very small compared with that at our own. Its annual conversazione was always well attended, and was much appreciated. About 1893, for various reasons, this Society ceased to exist, and an attempt to revive it a couple of years later did not succeed. In 1900, that is, fifteen years ago, a number of us determined that Sydney should have a Field Naturalists' Club, and we have steadily gone on our way, with various amalgamations, to the present day. I do not think that the troubles and difficulties that beset the earlier Societies are likely to overtake us. A short time after we started the members of the old Field Naturalists' Society met together and handed over to us all their property, consisting of a bookcase, with a number of books, forming the beginning of our present Library.

At the first meeting of the new Society, the New South Wales Naturalists' Club, Mr. A. H. S. Lucas, M.A., B.Sc., was elected President, and he held that position for two years, being followed by Mr. C. Hedley, the Assistant-Curator of the Australian Museum, and then by Mr. T. Steel, our present Editor; from that time onward the names of our Presidents are to be found in *The Australian Naturalist.*

Phases of study have passed over our Society, for, at its inception, marine zoology, more especially the branch of conchology, occupied a great deal of our time, and many of our excursions were marine, with only an occasional entomological, as, I think, there were but three entomologists then in the Society, and they were all specialists. I hope that the investigation of our marine fauna will not be allowed to drop entirely, as it is well worth study; and as we are a maritime city, collecting grounds are well within our reach. In our early days, as well as conchologists, we had a number of botanists, though their number was scarcely as great as it now is. Botanical excursions were frequent, and to places that are now almost destroyed from a botanical point of view.

I propose to shortly review the advantages Sydney possesses as a centre for Nature Study. Of all the capital cities of Australia, it is by far the most favourably situated. Built on the shores of a magnificent inlet, close to the Pacific Ocean, the marine zoologist is able to study the marine fauna and flora from the mud flat to the deep ocean. The County of Cumberland may well be considered our sphere of operations, for almost all parts of it are accessible to us in a day's outing. It is almost an island, excepting at its southern boundary, being bounded by water. Beginning from the coast near Bulli, we have a line to the Cataract River, thence along that river to the Nepean, which the boundary follows to the sea north of Sydney, at Broken Bay. Almost the whole of this large area consists of the extensive Hawkesbury sandstone, carrying a somewhat uniform fauna and flora. The area, however, is broken up with a number of constant streams and invaded by several deep indentations, which cause considerable local variations. Again, in places we find the overlaying Wianamatta shale, which influences the flora more than the fauna. Within easy reach of Sydney we have the lower formations of the Narrabeen shales at Narrabeen, and the upper coal measures in the Northern Illawarra district, which allow the last southern remnants of the northern shrubs to find means for their existence. These scrub areas, though small compared with those further north, with their palms and vines, give a different look to the vegetation, and influence the fauna and flora to a very great extent. Again, though further distant from Sydney, and beyond the boundaries of the County of Cumberland, the highlands of the Blue Mountains are available to us for study, and we have had several whole and half-day excursions to them, and been able to study a fauna and flora more akin to that of Victoria and Tasmania.

Though the advance of settlement has driven away most of the larger peculiar animals from the neighbourhood of Sydney, in the earlier days they existed here; the first emu was shot near Sydney, and also some of the larger coastal marsupials. The *Echidna* is even now seen at times, a specimen being in my garden at Killara some few years ago; and I have also seen a native bear at Roseville.

In speaking of the fauna of Sydney, I will naturally confine my remarks to the two groups—the butterflies and the shells—which I have studied more particularly. The warm Notonectian current running south along our coast brings with it many species from the tropics, which gain more or less a foothold in suitable spots in our harbours and on our coast. I would draw your attention to the number of tropical species of cowries that have been found in Sydney Harbour and at the entrance to Botany Bay. True, cowries are found in Tasmania and Bass Straits, but these are not tropical species; whilst all the species of Sydney Harbour are forms such as we get on the coasts of Queensland and in the South Sea Islands. I have myself found living in Sydney Harbour, and near the entrance of Botany Bay, over fifteen species of cowries, and most beautiful objects they are, when seen crawling with their mantles fully exposed. Whether these cowries are still to be found I cannot say, as it is now nearly twenty years since they were collected; but it is hardly possible that the commoner species of that time have all disappeared; with one or two species very few specimens were obtained, and these may have succumbed to the utilitarian purposes to which our foreshores have been put. Another curious remnant from the north is *Strombus luluhuanus*, which was at one time to be found in a small area at Vaucluse. Not only these species, but many other highly interesting forms are to be found in suitable spots. Who is likely to forget the first sight of *Bullina lineata*, the beautiful white shell crossed with lines of deep pink, the milk-white animal with its edging of pale electric blue, or the leopard-spotted animal of the hairy *Triton*. The flats of Port Hacking yield a wealth of interesting forms, such as the *Natica*, slowly crawling just beneath the surface of the mud. Here also we find the pointed *Pinna* in the mud. The first time I found this shell was by accidentally striking my foot against it. Near by, on the sandy portions of the flat, was to be found the *Pecten* alive, usually with a piece of green weed attached to the upper valve, for purposes of concealment. I might speak of many other interesting forms, such as the almost extinct *Trigonia*, and the lamp shell, *Waldhemia australis*, both of which have been found in Sydney Harbour. Species belonging to many other groups might been mentioned, but a visit with a marine zoologist at low tide to Long Reef, Watson's Bay, or the entrance of Botany Bay, would amply repay our members, add to their knowledge, and revive the interest in marine collecting, which has of late waned in our Society. As showing the wealth of specimens to be found in a confined area, a friend of mine, the late Mr. A. V. Henn, some twenty years ago found a derelict bottle at Watson's Bay, and with great patience and care sorted out its contents, which comprised 155 distinct species of shells. I have felt constrained to speak thus of my early friends, the shells, in hope that some of our members will take up the study in earnest of this branch of our marine fauna.

Though my earliest field naturalist work was almost entirely shell collecting, I had always taken a keen interest in our butterflies and moths, but had not attempted a collection, owing to want of knowledge of their preservation. However, my friend, Mr. Henn, remedied this difficulty, and I well remember my first lesson in capturing a moth in his dining-room one evening, with great danger to the ornaments and gas globes.

As regards numbers of species, Sydney is one of the best districts in Australia for butterflies, for, in addition to being the northern limit for a number of southern, it is the southern limit of many tropical species. And with this is bound up the whole question of the distribution of butterflies (and also most other animals) in Australia and the neighbouring islands.

Australia has a few survivals of very ancient types, long predating the other portion of the butterfly fauna. The origin of these few species is doubtful, and will probably never be known. The great majority of our butterflies fall into three groups, first, the Australian group, inhabiting Tasmania, Southern and Southern-Eastern Australia, and said to be derived through Antarctica. Though this is probable, as yet I have not been able to find any direct evidence of it. In this group the two or three species which I consider still older may possibly find a place, but this is, in my opinion, very doubtful. The region inhabited by this group has been termed Euronotian by Professor Tate, and Bassian by Professor Baldwin Spencer. Though chiefly found in South-Eastern Australia, there is no dividing line, and the species mingle in the Central East Coast, and even predominate in the higher portions of the Main Divide and Queensland. Already a slight division into an Eastern and a Western region is to be found, and these divergences will increase as time goes on. The characteristic groups of butterflies inhabiting this Southern and South-Eastern region are *Heteronympha, Xenica* and the skippers.

The second great group is that which has reached us from the north, and about this we can speak with more certainty, as it has appeared within comparatively recent geological times. This second group is the Papuan element in our fauna, having had its origin somewhere near the great island lying to the north of Australia. There appears to have been at least three migrations of butterflies from the centre of dispersion of these Papuan forms, and along the radii of these dispersions we have to take into consideration climate, distance, and time, as well as natural barriers. To the older of these migrations belong the several Papuan butterflies we see about Sydney, the large black-and-white orange feeder *Papilio aegeus*, and the black and blue camphor laurel feeder *Papilio sarpedon choredon*, and many others; the remaining migrations into Australia from New Guinea have not reached so far south along the East Coast as Sydney, and so do not particularly concern us. Sufficient to say that these species that are limited in their ranges east and west of New Guinea do not extend so far south in Australia. The third group of butterflies is the element in North-West Australia, received from the Malayan Archipelago, by way of Timor. This group is not a very large one, being only represented by a few species near Darwin, and has very little influence on the butterfly fauna of the rest of Australia.

PRIZE ESSAY.

Members are requested to note that Mr. E. J. Bickford has offered a prize of £1/1/- for the best essay on "The Orchids of New South Wales."

Balance Sheet, year ending July 31st, 1915.

RECEIPTS.

	£	s.	d.
To Balance	114	12	5
„ Subscriptions	64	4	6
„ Sale of Publications	0	16	9
„ Advertisements in Journal	5	0	0
„ Interest Savings Bank	3	14	2
	£188	7	10

DISBURSEMENTS.

	£	s.	d.	£	s.	d.
By Rents—Royal Society ..	12	15	0			
Arts and Crafts ..	10	0	0			
				22	15	0
„ Printing Journal	20	17	9			
„ Printing Cards and Circulars	1	2	8			
				22	0	5
„ Typing, Posting Journals, etc. ..				17	17	9
„ Box G.P.O.				1	5	0
„ Petty Expenses				7	3	11
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Hon. Treasurer.

Vol. III.—Part 9.   January, 1916.

THE
Australian Naturalist

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OF
The Naturalists' Society of New South Wales.

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The Author of each Article is responsible for the Statements and Opinions expressed therein.

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1915.

The Naturalists' Society
OF NEW SOUTH WALES

ROYAL SOCIETY'S HOUSE, ELIZABETH STREET,
SYDNEY.

Office Bearers, 1915-1916.

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Publication Committee—The President ; Hon. Editor ; G. A. Waterhouse.

The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

LIBRARY.

The Hon. Librarian is in attendance at the Library, Arts and Crafts Room, Norwich Chambers, Hunter Street, from 3 to 5 p.m., on Tuesdays. Members are invited to make use of the Library.

NOTICES.

The next MEETING will be held on Tuesday, February 1st, at 7.45 p.m., in the Education Building, Loftus Street.

The usual notice of the business will be sent to Members.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE
Australian Naturalist.

Vol. III. JANUARY 4, 1916. Part 9.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

5th October, 1915.—Mr. W. W. Froggatt, F.L.S., President, in the chair, and about 40 present.

The following were elected members:—Misses Dora Gillam, M.A., Hinder and Dora Hinder, Messrs. H. Pott, Gilbert Wright and N. Hewison.

Mr. F. W. Carpenter gave a most interesting and instructive lecture, entitled "The Physical Side of Osmosis," illustrating his remarks by a series of chemical experiments.

The President intimated that arrangements had been completed with the Department of Education for the free use of the Assembly Hall in the new building in Loftus Street, and that for the future the monthly meetings would be held there.

Mr. A. A. Hamilton exhibited a series of interesting herbarium and fresh specimens, with comments; Miss Sulman, flowering specimen of the New Zealand *Veronica Hulkeana,* grown at Lawson; and, with Mr. R. H. Cambage's permission, some notes on his paper on "Acacia Seedlings" (Proc. Royal Soc., New South Wales, XLIX. 81); the President, Lerp galls, *Rhinocola revoluta,* on eucalyptus, from Austinmere.

2nd November, 1915.—Held in Assembly Hall of new Department of Education Building. Mr. W. W. Froggatt, President, in the chair, and about 60 present.

The following were elected members:—Misses Mabel Mallett and Ada Keith.

Mr. A. A. Hamilton exhibited a series of flowering plants and ferns, including *Dryopteris* (*Aspidium*) *decompositum,* and gave an explanation of the method of attachment of the indusium. Miss Sulman, a phasmid, illustrating protective colouration. Miss Mabel Brewster contributed a note on the life-history of *Gryllotalpa coarctata,* illustrated with specimens.

The President announced that the Council had decided to offer a prize of £1/1/- for a suitable design for a cover for the *Australian Naturalist*, to be the work of, and competed for by, members only.

The President then gave a most interesting address on "The Rise and Progress of the Society," referring particularly to the work done in the past by its Presidents and officers.

Mr. E. S. Edwards, M.A., voiced the appreciation of the Council and members of the recognition accorded to the Society by the Department of Education in granting them the use of the fine new Assembly Hall for their meetings.

Mr. D. G. Stead, F.L.S., gave an instructive account of the work being done by the State trawlers from a scientific as well as economic aspect. He referred to the discovery of sharks and certain other fish at great depths, this being the first record thereof.

7th December, 1915.—Mr. W. W. Froggatt, F.L.S., presiding, and about 40 present.

The following were elected members:—Misses Sturrock and J. Roberts, Messrs. L. J. Mitchell, C. Yates Whiteman, R. Houston, T. J. Little.

Miss Flockton sent a nest of the mistletoe bird, *Dicæum hirundinaceum*; Miss Sulman, flowering specimens of *Angophora lanceolatus* and *Eucalyptus stricta* from Lawson, with notes; Mr. A. A. Hamilton, a series of the New South Wales species of *Dryopteris* (Aspidium), and a selection of mounted plants, with comments; Mr. H. E. Finckh, jaws of a ray, now being sold in Sydney as "skate," with explanation of the food-crushing design of the tesselated teeth; Mr. Froggatt, a collection of Myrapoda (Centipedes) from New South Wales and New Hebrides, named by M. Broleman, of Pau, France. A list of these is being published in the current number of the Proc. Linn. Soc., New South Wales. Mr. E. Cheel, seedling of *Eucalyptus Smithii*, showing the opposite arrangement of the first leaves and conspicuous oil glands on the young stem above the cotyledons; also a series of interesting plants from Hill Top.

Mr. Thos. Steel, F.L.S., gave an excellent lecture on "The Sugar Cane," illustrated with a large series of specimens, including fresh cane grown at Pennant Hills, seedling canes, and a fine set of lantern slides.

The President notified that the next meeting would be in February, 1916. The President read greetings from our fellow-member, Mr. Goldfinch, now on active service at Gallipoli.

MISCELLANEOUS BOTANICAL NOTES.—*Continued.*

By A. A. Hamilton.

Caladenia dilatata, R. Br.—A variable species, as is the case with most plants having a wide range. Bentham, "Flora Australiensis, 6.382," considers it to be a variety of *C. Patersoni,* R.Br. Fitzgerald, "Australian Orchids," differs and figures both as distinct species, incidentally entering upon a lengthy and interesting dissertation on the differences of opinion between the collector, who has seen his plants in the field, and the botanist, who is frequently called upon to give a decision on the evidence of dried specimens alone. With many Orchids the colour of various parts of the flower is an important factor in determining the species, and this is frequently lost in the process of drying. Mr. Fitzgerald also resuscitates the much-debated question as to the line of demarcation between a species and a variety, and invites consideration as to the manner in which natural hybridisation may affect the issue. This species does not appear to occur frequently in the Port Jackson district (the writer has twice seen it in that area, on one occasion at Cook's River and again at Sans Souci, where it was recently collected by Mr. E. Breakwell, a member of this Society), though its rarity may be more apparent than actual, owing to the well-known erratic periodicity of flowering affected by members of this family, many of which require some special stimulus to induce flowering. A case in point is that of *Lyperanthus nigricans,* R.Br., which appears to only flower after the passage of a bush fire.

Botrychium ternatum, Swartz: Scarborough, Illawarra.—A fern with a tuberous rootstock, whose fertile and barren fronds are borne on the same stipes, though the fertile frond is rarely seen. The writer has collected this fern on several occasions and had it under cultivation, but has not had the good fortune to see a fruiting frond on a live specimen. In most ferns the young frond is rolled up (circinate), but in this and the closely-allied genus, *Ophioglossum,* the fronds do not unfold, but are produced in much the same way as the pinnatisect leaves in some of the Umbellifers. Although it has a fairly wide range in the coastal area, it is seldom collected, as it is not exceptionally conspicuous, and its habit is not gregarious. The foliage dies annually and is renewed from the perennnial tubers.

Ipomea palmata, Forsk, "Egyptian Bindweed."—A perennial rock-clinging or climbing plant, with a tendency to grow near salt water. It may be seen at Manly scrambling about the rocks by the side of the road leading to Blue Fish Point. It has a long flowering season (the writer has known it to be in flower for five months), and is a strong grower, a fact which has been amply demonstrated by Mr. Fred Jackson, who has a plant running over an arbour at his place at Carlingford, in company with that aggressively robust climber, *Dolichos lignosus,* Linn., and holding its own, though it has had no extraneous assistance. It is a favourite ornamental plant in Egyptian gardens, and was originally named *Convolvulus cairicus,* by Linneaus, doubtless an association with the ancient city of Cairo. The palmately-lobed leaves (from which the plant derives its present specific name), and the prominent beard on the angles of the seeds, are characters by which this species may be identified. Mr. Jackson incidentally mentioned that he had seen it growing at Norfolk Island when on a recent visit. On looking the matter up, it was found that the species is not recorded from this locality in our Australian works of reference. A paper on the "Flora of Norfolk Island," by the Government Botanist, J. H. Maiden, F.L.S. (Proc. Linn., Soc., N.S.W., 28-711), was consulted, and our species disclosed in his list of plants found on Norfolk Island. Mr. Maiden says: "It is found all over the island climbing the highest trees. A cosmopolitan species widely dispersed in Tropical Africa, Asia, and America, with a range in Australia coastally, from New South Wales to Queensland. It is easily grown from seeds, which are produced continuously during the lengthy flowering season."

Leucopogon Richei, R.Br.—One of the "White Beards," which has chosen for its habitat a bleak-exposed situation on the sand-dunes at Lady Robinson's Beach, generally out of reach of the waves, but spray-swept and dwarfed by the salt-laden breezes. In conjunction with *Correa alba,* Andr., and other shrubs characteristic of the dune formation, it offers a stern resistance to the onslaughts of the encroaching drift sand (which threatens the existence of the vegetation), acting as a second barrier, the first line of defence being formed by that unsurpassed indigenous sandbinder, *Spinifex hirsutus,* Labill. The berries of *L. Richei* are about the same size, and have the pale semi-transparent appearance reminiscent of the British "Mistletoe" (*Viscum album,* Linn.). An excellent figure of this species, with carefully drawn detals, may be found in Labillardiere's *Plantae Novae Hollandiae, v. 1 t. 60.* It was grown at Kew, and in other British gardens as far back at 1830. The seeds do not germinate readily, owing to the hardening of the endocarp during the process of ripening, and for this reason it is usually grown from the cuttings. Sowing the seeds while the seed-coat is still amenable to pressure by the enclosed cotyledons (before it becomes bony) would probably yield favourable results. It has a considerable range, but is not often found away from the vicinity of the beach.

PROTECTIVE RESEMBLANCE IN LEAF GRASSHOPPERS.

By Miss Gladys H. Froggatt.

Which amongst all creatures has such a hard struggle for existence as a litle insect? It has so many enemies, and is, comparatively speaking, so helpless. Birds and beasts prey upon its numbers, and so do men; even members of their own tribe prey upon each other. Indeed, insects would have a hard time of it were it not for their wonderful power of deception and mimicry.

Nearly all insects are actors to a less or greater degree. So great is their art of simulation that some, which are of most brilliant colours, are not at all easily detected among their natural surroundings.

One of the most wonderful examples of mimicry is that of the leaf grasshopper. My specimens here to-night come from the Solomon Islands. They are so very like the tropical forest leaves among which they live that it is well-nigh impossible to distinguish them when at rest among the foliage of the trees.

Being of sturdy build, they would have little chance to outstrip a bird upon the wing, so they trust entirely to their shape and coloration to escape observation. They rest all day, swaying among the leaves, waking to life at night to feed and move about. The specimens exhibited belong to the genus *Hyperhomola,* occurring in tropical climates.

CLIMBING METHODS IN AUSTRALIAN PLANTS.

Prize Essay by Miss F. M. Irby.

The two methods that seem to prevail over most others in our native plants, for climbing purposes, are tendrils, for attaching themselves to any object within reach; and the long sinuous shoot, a tender helpless-looking thing swaying with every breath of wind, but with snake-like head advanced, it grows and sways until it reaches the nearest suitable object, and gradually curls around it, ever twining closer and closer, sometimes, especially in the case of *Mucuna gigantea* and *Derris scandens,* cutting almost right through the luckless tree or shrub seized upon. Amongst the many plants that have this way of climbing are the *Wistarias*, the *Lonchocarpus Blackii*, and the *Bignonias.* The *Hoya* has the same manner of climbing, but most of its shoots are covered with a roughened surface like tiny undeveloped rootlets. The reason for this is not far to seek. The *Hoya* shoots, with their solid waxen leaves, are so heavy, that unless they find something within easy reach to cling to, their own weight drags them to the ground, and the rooted-like growth (which, in the event of the shoot finding something to climb, soon dries off and disappears) at once takes hold and grows.

The Native Passion Vines climb with the aid of single curly tendrils, which, catching hold of anything and everything within reach, enable the creeper to cover, with a curtain-like draping, whole clumps of shrubs and plants.

The little Red Melon has much the same habit of climbing, but in its case the much-curled tendril is forked.

The Native Grape also has a forked tendril; this is strong and vice-like, and usually takes but one or two twists round the object it attaches itself to.

Even more wire-like are the tendrils of the Bush Lawyer, *Smilax Australis,* a pair of which spring from the base of each leaf.

In the young shoots of the Climbing Bamboo the grass-like leaves taper into a delicate fibre-like tendril which seizes upon anything that comes in its way, and enables this handsome plant to climb over the heads of some of the tallest brush trees.

It is interesting to notice how the young plants of *Lyonsia reticulata* run straight up the stems of the tree they have grown near; the manner of climbing is rather curious, the under part of the running shoot being covered intermittently with a thick fibre-like growth, which clings with such tenacity that you have to pull off the bark of the tree with the creeper, for it will not loose its hold.

The Cork Creeper is aided in its climbing by tiny recurved hooks at the base of each pinnate leaf, and it is difficult to realise the strength of these tiny thorns until you have attempted to force your way through a thicket of the fern-like foliage.

The Lawyer Palm, *Calamus Australis*, is another plant that climbs with the aid of recurved hooks. A beautiful plant, with its graceful bright green foliage, and its red-brown stems covered with fine cactus-like thorns. Leaning gracefully against the nearest plants or shrubs, it sends forth long rapier-like feelers, densely covered with recurved hooks, which, clutching anything in their way in a grip which makes escape seem well-nigh impossible, enable the plant to wander on over the bushes in a grim, relentless way.

THE MOLE CRICKET, "GRYLLOTALPA COARCTATA."

By Miss Mabel N. Brewster.

On a bright afternoon of November, 1915, I heard several crickets chirping, and going carefully towards the sound till I had located them, I pulled up a number of plants of the Umbrella Sedge (*Cyperus*), for crickets love roots of plants. I turned over the soil and found a beautiful little cricket home, with two little doorways leading into a tiny underground cavern about two inches in diameter. Its walls were quite firm and strong, and near this little home were a small and a large cricket.

I then turned over an old tree-stump log and gently scraped lumps of earth adhering to it, and, to my surprise, found that two of the lumps were little "egg-room" caverns, each with about 200 eggs in it. The eggs are brown and rounded. In one nest were two tiny baby crickets; one was just emerging from the egg, and was quite white. Under the log were also crickets in all stages of development, and there were two adults. I put a number, showing the various stages of development, into the killing bottle. After three hours I mounted and pinned out the crickets, and was just about to place the eggs in a box when I saw one of the eggs moving, and was fortunate enough to see the baby cricket emerge from the egg.

I observed the following with the aid of a lens. The skin was slit along the back and the tiny creature moved its head and thorax up and down, at each rising getting further out of the egg. The head and thorax came out, and later on the abdomen and the two tail appendages or cerci came next, and in this last effort it rolled the egg and itself right over. But the legs and mouth parts seemed to be connected with a fine piece of skin. For some time it moved about like a boy on a cross-bar, bending its body right back, and then swinging forward, it would roll itself and the egg right over from one side to the other whilst making these swinging movements.

The cerci were very distinct, and its legs were all bent up and connected with its mouth and parts under the head. The eyes shone like two pearls when seen in the light. At last one leg was free, and I then aided it by gently separating the other legs with a needle, for probably the exit was made more difficult because the earth pellet, to which the egg was attached, had broken away from the wall.

LIST OF INSECTS ASSOCIATED WITH ACACIA DECURRENS.

Noted in Mr. L. Gallard's Prize Essay.

The insects frequenting *Acacia decurrens* may be divided into three groups:—

1st. Internal workers, which as larvae bore in the wood.

2nd. External feeders, which eat the bark and leaves.

3rd. Suctorial insects, which suck the sap.

A supplementary group is added, comprising parasitic insects preying upon those included in the three above groups, and frequenting *A. decurrens* for this purpose.

The following is a list of insects belonging to these groups, all of which have been personally collected by the author:—

LEPIDOPTERA.

Group 1.

Zeuzera eucalypti, Porina (two species), Crytophaga unipunctata.

Group 2.

Odonestis Australasiae, Pinara sp., Limacodes longerans, Teara contraria, Teia anartoides, Euchloris submissaria, Selidosema lyciaria, Lophodes sp., Ialmenus evagorus.

COLEOPTERA.

Group 1.

Phoracantha fallax, Pachydissus sericus, Bisseis similis, Bisseis leucosticta, Uracanthus triangularis, Hebecerus crocogaster, Menyllus sp., Penthea vermicularia, Chrysolophus spectabilis, Perperus insularis, Orthorrhinus Klugi, Orthorrhinus cylindrirostrus, Leptops Hopei, Leptops tribulus, Belus semipunctata, Rhinotia hoemoptera, Mermacicelus formicarius, Doticus pestilans.

Group 2.

Cistelidae (three species), Glycyphana brunnipes, Paropsis immaculata, Paropsis liturata, Calomela curtisi, Calomela sp., Oides dorsosignata, Diphucephala aurulenta, Anaplognathus flavipennis.

HEMIPTERA.

Group 3.

Eumecopus Australasiae, Germatulus nasalis, Mictis profana, Sextius viricens, Siphanta acuta, Chalepus teliferus, Dactylopius albizziae, Icerya Purchasi, Lecanium baccatum, Lecanium sp., Mytilapsis acaciæ, Monophlebus Crawfordi.

PARASITES.

Beetles.

Natalis porcata, Hectarthrum brevifossum, Colydidæ sp.

Wasps.

Megalyra fasciipennis, Megalyra Shuckardi, Syngaster lepidus, Thaumasura, sp. (two species), Polycytus curvileatus.

All the above are parasitic on the larvae of longicorm beetles, the two latter on weevils also.

Echthromorpha intricatoria parasitic on Teia anartoides.

Neuroptera.

Chrysopa Ramburii, Micromis australis.

Coccinellidae.

Orcus Australasiae, Leis conformis, Cryptolaemus Moutrouzieri.

Moth.

Thalpochares pulvinariae, parasitic on Lecanium; also an unidentified black and white moth, and one each Syrphid and Trypetid fly.

PROTECTIVE HABITS OF SOME AUSTRALIAN MOTHS AND THEIR LARVAE.

By C. H. Wickham (abstract).

Of all creatures, Lepidopterous larvæ are among those that are least protected against birds and other numerous enemies.

There are, however, some very marked exceptions, such as those that are provided with stinging hairs, as the caterpillars of *Chelepteryx collesi*, *Ocinara lewini*, *Teara contraria*, and several members of the *Limacodidae.* The hairy covering of others probably protects them from the attacks of parasitic enemies and small birds.

In others, usually naked larvae, we find them living among leaves rolled up with silken strands; others, like the case or bag moths, living in a portable cocoon while going through the caterpillar stage of their existence.

The Crytophagidae and other species feeding at night upon the bark or foliage construct a burrow in the stem of the host tree, in which they hide during the day. The true wood-borers, *Hepialidae,* in the larval state live in the trunk or stems of trees, in which they finally pupate.

The "cutworms," larvæ of Noctuid moths, often bury themselves in the ground during the day, feeding at night. In the *Geometridae,* an allied family, the long, slender looper caterpillars resemble sticks or branchlets, resting motionless in the day time among the leaves.

Others, like the vine moth caterpillar, hawk moths, and other larvae which are distasteful to birds, have brilliant showy markings, which act as warning colours.

FISHING APPLIANCES FROM OCEAN AND PLEASANT ISLANDS.

Exhibited by Mr. F. Danvers Power.

Mr. F. Danvers Power exhibited some fishing appliances from Ocean (Panoopa) and Pleasant (Naru) Islands in the Pacific. He said that Kanakas were probably the best fishermen in the world, as the staple food of these islanders consisted of cocoanuts and fish. It was a picturesque sight to see these men in their canoes paddling along the edge of the reef after dark, catching flying fish. A man holds a torch made of dead cocoanut leaves, tied together every six or nine inches, the light of which not only attracts the fish, but enables the fishermen to see them. As a torch burns low, a tie is torn off, and the flame bursts out afresh. The fish are caught in a net with a handle about ten feet long, sometimes in the air and sometimes in the water. The average catch is about 100 in an evening. When the men have caught all the flying-fish they require, they fish with hooks for other kinds of fish. Hooks were exhibited made of mother of pearl, bone, and hair; a stalactite, bone and vegetable fibre; also wood, and of a bent wire nail. The natives will not use our barbed hooks, as they say they catch in rocks, etc., too easily. Sharks are attracted by a shark-bell, made of large cowrie shells threaded into strings, which, when shaken together in the water, not only make a noise, but flash. When a shark comes to investigate, a large wooden hook, baited with a flying fish, is thrown overboard, while the other end of a stout coir rope, to which it is attached, is looped over a horn at the stern of the canoe. When the shark is hooked it is hauled up alongside and clubbed to death. When the weather is stormy the natives are unable to fish in the ocean, so they breed fish in an inland lake. The fry are caught on the reef when the tide is out by men who paddle in the water armed with a wand and a kind of flat sieve, made out of the spathe from a cocoanut tree stretched on a wooden framework. The wand is used to drive the young fish up to the surface, when it is dropped, and the sieve is plunged underneath them. Those that are retained on the sieve are scraped up with a cocoanut shell and placed in a conch shell of water, in which they are conveyed to the lake. The lake is divided into paddocks by cocoanut leaves piled one on the top of the other, to form a wall; each paddock belongs to a family, and in rough weather the fish are driven into a corner by a row of natives, and caught in large rectangular hand-nets. Some fish are captured in a circular net kept under water by a stone, while above it a bait is tied to attract the fish, which, when they come to nibble at it, are drawn up. Walls of coral rock are built on the reef to retain fish left behind at low tide. Children catch small fish in the pools, more for sport than food, by means of a toy bow and arrow; the arrow has one end fastened to the string of the bow, so when a fish is transfixed it cannot escape. Eels are caught by a noose at the end of a short stick. The fisherman chews up some flesh of a cocoanut for burley, and spits it out in front of the hole in which he suspects an eel is lying. In front of this hole is placed the noose, and when the eel comes out the string is drawn tightly round it, and the eel disabled by a knock on the head with a club.

The chief birds on the island are a small land bird with a note somewhat like that of the Australian nightingale, the frigate bird, white tern, noddy, blue crane, white crane, and a sand-piper.

The frigate bird (Itchee) is kept as a kind of pet by the natives on the roof of a booth-like structure called a bird-table. These birds are caught by a kind of sling shot. One of these was exhibited, and consisted of a piece of clam shell, nicely shaped, attached to a string 15 or 16 fathoms long. The coil of string is held in one hand and paid out between the finger and thumb as the weight is thrown over the bird after swinging it round a few times. The men sometimes have catching competitions, 30 up. At evening these birds go out to sea to meet the terns and noddies as they return to the island. These they catch by the tail, and, tipping them upside down, give them such a scare that they disgorge their supper, which is immediately devoured by the pirates. The white tern lays one white egg in the fork of a branch without any attempt at constructing a nest. Noddies are also tamed and kept as decoys, being taken up to the higher land on their perches in the evening, and caused to cry out. This attracts the wild noddies as they return to roost, when they are caught by men with long-handled nets. The sandpiper (Dicketeboir) is kept by the young men for fighting purposes. They never get killed, because after fighting for about four minutes one bird reckons he has had enough, and runs away. A bird once beaten will never fight again.

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The Naturalists' Society
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Publication Committee—THE PRESIDENT ; HON. EDITOR ; G. A. WATERHOUSE.

The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

Members with nominations should hand in names and addresses to the Hon. Secretary before each Meeting.

Meetings are held monthly on the first Tuesday Evening (except in January).

Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

LIBRARY.

The Hon. Librarian is in attendance at the Library, Arts and Crafts Room, Norwich Chambers, Hunter Street, from 3 to 5 p.m., on Tuesdays. Members are invited to make use of the Library.

NOTICES.

The next MEETING will be held on Tuesday, May 2nd, at 7.45 p.m., in the Education Building, Loftus Street.—Lecture by Mr. D. G. Stead, F.L.S.

MEETING, June 6th.—Members' Night.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

MELBOURNE

THE
Australian Naturalist.

Vol. III. APRIL 4, 1916. Part 10.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

EDITOR'S APPEAL.

The Editor appeals to members to furnish him with properly written or typed manuscript. Careless scrawls or rough notes involve a great amount of re-writing and editing, and it is scarcely fair to expect the Editor to undertake work of this kind, which should be unnecessary. Authors should also carefully verify the spelling of scientific names, and write these very plainly. Write only on one side of paper.

Editor A.N.

ORDINARY MEETINGS.

1st February, 1916.—Mr. W. W. Froggatt, F.L.S., President, in the chair, and 45 present.

Mr. J. A. Pattinson was elected a member.

The Hon. Treasurer announced that the Society had invested the sum of £50 in the War Loan.

The Hon. Secretary notified that the Publication Committee, with the authority of the Council, had decided to issue a work consisting of a record of the plants, indigenous and introduced, of the County of Cumberland, following the lines laid down by the Rev. Dr. Woolls. This work, which was very much required, would be edited by Mr. Edwin Cheel, which was a guarantee that it would be reliable and useful. He also announced that Miss Gladys Froggatt (Millie-Millie) was publishing an entomological book, entitled "The World of Little Lives," being nature studies of insect life. The work would contain 160 pages, illustrated with plates and text-blocks, and the price would be 3/6.

Mr. L. Gallard exhibited live specimens of *Scuttelista cyanea,* parasitic on the olive scale, *Lecanium oleæ,* and bred from scale occurring on a passion vine at Eastwood in January. He stated that this parasite was brought from California some 15 years ago, and it was thought to have failed, but during the past two years it had been plentiful. Mr. Froggatt explained that although it had been imported, as mentioned by Mr. Gallard, it was indigenous to New South Wales. Miss Gladys Froggatt exhibited a wasp, *Exirus lateritus,* and its victim, a burrow spider, *Lycosa Godeffroyi,* and read a most interesting note on the encounter between the two. Miss Hinder exhibited a chameleon and frog from Egypt, obtained by an Australian soldier, and read an instructive note on the former. Mr. Froggatt, a collection of "Policeman Flies" (wasps of the family Myssonidae), with descriptive notes. Miss Sulman, a series of plants which she had collected at Mount Wellington, Tasmania. Mr. E. Cheel, on behalf of Miss Irby, a fine series of *Acacia* from Gilgandra. Mr. E. Cheel, peculiar and interesting Australian Lichens, together with examples of the Hygrometric Club Moss, and the Syrian "Rose of Jericho," illustrating the expansion of the thallus when moistened. Mr. A. Gale presented the Society with copies of his "Australian Bee Lore and Bee Culture," and "Nature and Aquarium Notes."

Mr. E. Cheel exhibited a seedling, *Eucalyptus Smithii,* R. T. Baker, raised from seeds collected near Mount Jellore in October, 1915. The plant is about 1¼in. high, showing kidney or reniform-shaped cotyledons and three pair of linear-lanceolate leaves, the first pair not quite opposite, the two next pairs distinctly opposite.

Twenty-three seedlings were raised together, and are being planted in a shallow gully at Hill Top for the purpose of making notes on the growth and quantity and weight of foliage for distilling purposes.

It is interesting to note that the stems above the cotyledons are studded with minute tubercles, which are probably oil-glands, easily seen by an ordinary pocket lens.

He also exhibited male flowers and upper leaves of *Freycinetia sp.,* communicated by Mr. D. W. Shiress from New Guinea. The specimen is very similar in appearance to *F. Banksia,* a New Zealand species, which produces large spathe-like bracts, which are fleshy and edible in a raw state, as well as being useful for making luscious jelly, having a strawberry flavour.

March 7th.—Mr. H. E. Finckh in the chair, and about 30 members and visitors present.

Apologies for absence from the President and Mr. E. Cheel were read. Master Horan was elected to membership.

Miss Agnes Brewster gave an excellent lecturette on "Some Native Plants and Their Visitors," illustrating her remarks on pollination by very clear sketches. Mr. L. Gallard exhibited a further series of wasps parasitic on Longicorn beetles and on Fruit Flies. Mr. H. E. Finckh, the large bean of *Poinciana regia,* and a fruit of *Kigelia pinnata,* the latter being used medicinally in rheumatic complaints. Mr. A. A. Hamilton, *Siebera Stephensonii, Bauera capitata, Oxylobium cordifolium,* and *Pulingia hermanniaefolia,* rare shrubs, collected near Botany Bay; also a series of ferns representing New South Wales forms of *Aspidium,* with notes.

THE PHYSICAL SIDE OF OSMOSIS.

(SUMMARY.)

By F. W. Carpenter.

The earliest physical experiments on Osmotic Pressure were performed with a view to imitating the action of plant cells, more especially those in the root in which osmosis takes place. After many failures, artificial membranes made of copper ferrocyanide, supported on the porous structure of an unglazed earthenware pot, were found to give satisfactory results. With increased care in the construction of these colloidal membranes of copper ferrocyanide, it was found that the best membranes are impervious to dissolved substances, whilst they allow the free passage of water. Such membranes act like a very perfect filter or sieve, which is able to prevent the passage of all but the very smallest molecules. It is easy to make membranes which are impervious only to the larger molecules, such as those of sugar, or of the other substances occurring in the sap of plants.

Experiments were shown in which the root pressure of the plant was imitated by immersing a prepared cell containing sugar solution, in a vessel of pure water. In the living plant the sap plays the same part as the sugar in our experiments; and a continuous flow of water can be maintained from the soil through the roots to the plant.

This water is charged with various salts necessary for the nutrition of the plant, and these dissolved salts are carried into the cell at the same time as the water enters. Thus the same cell wall which is impervious to the sap is permeable to the smaller molecules of the soluble salts. A partial explanation of this important difference from the perfect physical membrane is afforded by a consideration of the coarse-grainedness of the protoplasm, which forms the outer wall of the cell. If this cell-wall is constituted with a coarse enough mesh, it will allow water and the molecules of soluble salts to pass through, whilst stopping the passage of the larger molecules contained in the sap.

Several cases in which this simple mechanical explanation is inadequate were pointed out, and some possible explanations discussed.

Some further experiments were shown of the growth of colloidal membranes of various silicates, which are readily formed by putting small crystals of various metallic salts in a dilute solution of water-glass.

ENCOUNTER BETWEEN SAND WASP (EXEIRUS LATERITUS) AND BURROW SPIDER (LYCOS GODEFFROYI).

By Miss G. F. Froggatt.

We were at lunch when we saw the fight begin on the grass plot just in front of the window. We reached there in time to see the yellow and black fury hurl herself at the big brown spider, many of which have silk-lined burrows in the turf. The spider was three times as big as the sandwasp, but was bewildered by the savage onslaught, and unable to parry the darting sting with which the wasp kept pricking it, always managing to pierce it underneath the body. In a minute or two, however, the spider suddenly leapt up and sprang away frenziedly the wasp searched about, tripping among the grasses and using her wings to find where the spider had jumped.

That was the spider's last bid for freedom. Fiercely the wasp flung herself at it again, stinging it on the underside of its head, when it stopped all movement.

The wasp paused, wiped her face with her forefeet, combing her antennae, rubbing the hind legs over her body, smoothing her wings,; in fact, freshening herself up generally after the struggle. Just then another big spider suddenly appeared, and she dashed after it, forgetful of her stunned prey; but the new spider bounded right across a path and was lost in a border of violets.

While the wasp was chasing the second spider another Pompilid wasp flew by and found the helpless stunned spider; and a battle had to be fought between the two Pompilids for its ownership, the first huntress winning it back.

Then she started to carry the booty home. She caught the spider firmly by the head, walking backwards and dragging it along. Never once did she look behind her as she descended the steep bank; and backing surely and swiftly, she hurried along an asphalt pathway leading to the back of the house and away from the lawn. Then over a garden bed she backed, all in one long straight line, while we followed slowly, wondering how far she would lead us till she found her burrow. A jasmine-covered lattice divided the garden from a grape-trellised asphalt court, but this gave her no pause whatever. Through the close lattice she felt her way backwards with her long legs, as if, indeed, they might have had eyes; then, on over the asphalt court she hurried, still in a straight line, but at a slight angle to the line on lawn side of the lattice. More slowly she dragged her prey over a strawberry bed; and quite heavily she made her way over the uncut dense buffalo grass beyond. There she made her first pause—maybe the entomologist and I scared her as we followed and peered so closely. But only for a few seconds did she dawdle; then off again, always so very sure of her way that she never even looked behind to see if her direction was right. Past the tomato beds she backed, over grass and weeds, right down to the wood-shed, until we wondered whether she would lead us beyond our own fence. Near the shed she hesitated, hunted round a little space, and then, in a flash, she disappeared down a hole among the chips, dragging the big helpless, alive but paralysed spider after her.

Pop went our chloroform tube over the hole, and presently we carefully set to work to open out the underground nursery which she was stocking with spiders, and upon which she had meant to leave her eggs, so that her grub babies might have fresh spider diet to thrive upon.

A wattle tree covered the shed, and in opening out the ground we found a young Cicada crawling up one of its roots. When we opened the wasp's nest from the side, so as to see the vertical shaft, we found that it was 8½ inches from the surface to the bottom of the hole. It was only the beginning of a nursery, so we took the wasp and the spider, and then measured the distance she had traversed. It was 43 yards, almost in one direct line, just turning once at an angle after she backed through the lattice. We had been watching her for over twenty minutes.

NOTES ON SOME CURIOUS FORMS OF WANDERING LICHENS, INCLUDING THE SO-CALLED "MANNA" OF THE ISRAELITES.

By Edwin Cheel.

At the July, 1913, meeting of the Linnean Society of New South Wales (vide Proc. Linn. Soc., N.S.W., Vol. xxxviii. (1913) 396), I exhibited some interesting specimens of a lichen (*Parmeliopsis semiviridis*), which have a peculiar habit of wandering about from place to place, and are also peculiar in that they inroll during dry weather, and unfold in damp or rainy weather. In addition to the various proceedings of scientific societies in which this species is recorded under various names, I pointed out that it was originally collected in Tasmania by Robert Brown in 1802-1805, and afterwards on the Murray River by Baron von Müller, and at Belltrees, Scone, by Mr. H. L. White, and Old Man Point, Canoblas, by Dr. T. Harvey Johnstone. Since the above note was published, I have received a fine lot of specimens from near Cooma, in this State, collected by Mr. G. Marshall, who sends the following interesting particulars concerning it:—"Originally it was noticed on portion of the open common grazing land here, about two miles east of Cooma. It was seen there each year, but this year none has been noticed on the old area, but it has shifted further east, about another mile, on a hilly slope, covering about 100 acres, and in fair abundance." A slightly broader form described under the name var. *major*, has been recorded for Spencer's Gulf, and Mount Elm, collected by Mr. Giles, and from Fraser's Range, S.A., by Mr. R. Helms, as well as from Mueller River, Queensland, by C. W. Birch. The specimens very closely resemble some forms of *Cladonia foliacea,* especially the var. *Convoluta,* and by some Lichenologists, has been placed under this genus. A very closely allied species, *Cladonia degenerans form eratica,* has been found at Woodburn, Saddle Hill, New Zealand, which is said to become curled up into ball-like masses, detached from the ground in the course of time, and then roll freely before the wind on the downs about the seaward base of Saddle Hill. In the journal of botany, vol. liii. (1915), 308, some notes are published on still another interesting species of lichen, *Parmelia revoluta* var. *concentrica,* which Mr. R. Paulson exhibited at the Essex Field Club on 28th November, 1914. In this case it is reported that the plants were found on the grass quite unattached to any substratum, and are liable to be moved about by the wind when it blows with any force. Some few years ago (vide Proceedings Linnean Society of N.S.W., Vol. xxxiv. (1909), 591), I drew attention to the rapid unfolding of the thallus of *Heterodea Mūelleri,* as well as *Parmeliopsis semiviridis,* when the specimens were moistened with water, and pointed out that they were even more interesting than either the Hygrometric Club Moss (*Selaginella lepidophylla*) or the Syrian "Rose of Jericho" (*Anastatica hierochuntica*), which were frequently offered for sale to travellers, with circulars extolling the virtues, real or imaginery, of these two species. Another species of lichen, which has attracted considerable attention, is the so-called "Wandering Lichen of the Desert," or "Manna Lichen" (*Aspicilia esculenta* (Pall.) Elenkin). Several extremely interesting articles on this species have been written, and some of the authors who have gone into the matter very carefully, chiefly from the biblical standpoint, think it likely that *Aspicilia esculenta Elenkin* (*Lecanora esculenta* Pall.) is the original of the manna.

The word "manna" is, in Etoc's opinion, derived from the Hebrew words Man = food, and hu = prepared; the Jews are supposed to have exclaimed, "Man hu" at the sight of the rain of manna.

An article published by A. Elenkin points out that a certain group of lichen separate early from the stratum on which they grow, and live in this state for an unlimited time, and may be blown about in this period enormous distances over the deserts and plains. In the Gardener's Chronicle, 1849, p. 581 and p. 611, a very full account is given, in which it is pointed out that a substance, eagerly devoured by the natives of Persia, Armenia, and Tartary, whenever it occurs, has been identified as a lichen, which at times appears in prodigious quantities.

DISCUSSION ON PROTECTIVE AND ATTRACTIVE MIMICRY IN PLANTS.

By Edwin Cheel.

It has already been pointed out by C. B. Plowright, an eminent authority on Fungi, that the subject of mimicry in the various kingdoms of Nature is one of very great interest, especially since the evolutionist has shown its importance to the well-being, or even perhaps almost to the existence of certain specific forms. It may be that the more striking manifestations of protective mimicry are to be found in the animal kingdom; but all mimicry is not protective, neither is it by any means confined to the animal kingdom.

In working upon the subject, it is exceedingly difficult to avoid being led away by the imagination beyond the limits of reason, to fancy forms which do not exist, and to see similarities where there are none.

Of the hundreds of species of Agaricaceæ, comparatively few are of a grass-green colour. *A. odorus and A. oeruginosus* are the two commonest green-coloured species in Europe, but why these two species should simulate their grassy surroundings has not yet been explained. It is a well-known fact that Agarics as a rule are very showy and attractive, as they are usually of various shades of brown, grey, pink, reddish, and purple.

It has been suggested that the Pezizæ group of fungi, which includes the well-known *Peziza vesciculosa,* occasionally seen around the Sydney district, and many other species usually found on decaying vegetable matter, and on trunks of trees, avail themselves of protective mimicry.

Worthington Smith has pointed out that *Hypholoma fascicularis* mimics *H. capnoides,* and that *Clitocybe dealbatus* mimics *Clitopilus orcella;* also that *Hebeloma fastibilis* mimics *Psalliota campestris.* The latter is the well-known edible mushroom. There are a number of instances on record in which certain species of fungi mimic the odours of various substances, such as vegetables, animal, and even their own allies.

These odours are of the most diverse similitudes, which to some people are very offensive, while to others agreeable. A few instances may be cited as follows:—

Hydnum graveolens and *H. tomentosus* give off an odour similar to that of *Melitotus officinalis*. *Cantharellus cibarius* has a similar odour to that of *Prunus armenica*, the cultivated apricot. Quite recently Dr. J. B. Cleland collected some small agarics at Mosman, which we determined as *Mycena porreus*, the odour of which was very strong, anl almost identical with that of garlic. *Lactarius quietus* and *L. cyathula*, both have a strong odour, resembling the common house bug, *Cimex lenticularis*.

A number of agarics give off odours which are similar to the smell of camphor, iodoform, and hydrocyanic acid, and of gas-tar water.

A large number of the Phalloideæ group occur frequently near human habitation, which tends to prove that they have become domesticated. For example, *Phallus indusiatus*, *Lysurus Gardneri* (*L. australiensis*), and several other species are nearly always found on rubbish heaps or in the kitchen garden near houses. The spore-mass of these species is usually very vile and objectionable, and attracts flies, which devour the foetid hymenia and give the minute ingested spores a wide dissemination. Some of these fungi also mimic either parts of animals or animal excrement.

For example, certain species of *Clathrus* resemble the entrails of some animal.

Fistulina hepatica, when young, is like an animal's tongue, and when old, is liver-like. In Europe the fungus *Peziza leporina* very closely resembles the ear of a rabbit.

In Australia we have an abundance of the Jew's-ear fungus (*Hirneola polytricha*) and *H. Auricula-judaea*, both of which resemble the human ear.

On the northern rivers of this State, and in Queensland, a minute Agaric, *Marasmius equi-crinis*, has sterile rhizomorphs, which are often mistaken for horse-hair, hence it is called the horse-hair fungus.

Then we have the cauliflower fungus, *Hydnum coralloides* and *Clavaria* spp., which resembles a cauliflower, and *Morchella conica*, which is very similar to small lumps of honeycomb.

For further references on mimicry, see M. C. Cooke in Grevillea, Vol. ix., p. 151; Worthington Smith, Gardener's Chronical, February 10 (1877); C. B. Plowright, Grevillea, Vol. x., pp. 1-14, and p. 89.

Mr. A. A. Hamilton, in the discussion on mimicry, etc., drew attention to mimicry in the British "Meadow

Orchids," *Orchis morio* L., the "Marsh Orchis," *O. latifolia* L., and the "Green Winged Orchis," all of which are known as false nectar flowers. They produce spurs which mimic nectaries, though they contain no honey, and are visited by honey-eating flies.

MISCELLANEOUS BOTANICAL NOTES.

By A. A. Hamilton.

Asplenium adiantoides (L.) Chr. a Spleenwort.—A graceful fern, which, in the Brush Forests of the Southern Illawarra, frequently produces fronds from its tufted crown from 4 to 5 feet long, with the black, glossy stem and midrib, which we usually associate with the "Maiden-hair" fern (*Adiantum*), a character evidently noted by the author of the species, and adopted by him when naming it. Among other characters used in the classification of ferns (Filices), the manner in which the spore cases (sporangia) are collected in clusters (sori), the shapes in which the clusters are arranged, and their disposition on the fronds are important factors. In the common Bracken-fern, *Pteridium aquilinum* (better known under its old name, *Pteris aquilina*), the sori are merged into each other, and form a continuous line along the margin of the frond. In the Maidenhair group the sporangia are enclosed in little pockets, which border the margin of the frond, in some species protruding beyond it. In several genera, including many of the "Tree-ferns," the sori are arranged in orbicular groups, and in the genus *Platycerium,* the clusters of sori become confluent and form large patches either on the points of the fronds, as in *P. bifurcatum* (*Cav.*)Chr., the "Elk's-horn," or on the broad part of the frond underneath the gap (sinus), between the points, in *P. grande* (*A. Cunn*), Sm., the "Stag's-horn." The typical Australian representative of the "Spleenworts" is the "Bird's nest" fern, *Asplenium nidus* L., whose sori, running in narrow elongated parallel lines (linear), at right angles to the midrib, will be at once recalled. The species of this genus diverge from the type by gradually shortening and broadening the lines of sori until they become oblong, and in some species oval, and their direction from the midrib passes from the typical right angle, to (in extreme cases) an acute angle. One of the "Spleenworts," *A. maximum* Don., a common Pacific Island fern (it grows also on the Northern Rivers in New South Wales), has its lines of sori disposed in graceful curves, reminding one irresistibly of the tattoo markings of the natives, the similarity giving point to the suggestion that this may have been the source from which the Islanders derived their artistic inspiration, the likeness being further accentuated by the brown colour of the spore-cases. The lines of Sori are particularly ornamental in the early stages of growth, when they are covered with a silvery membranous coat (indusium).

CALLISTEMON LANCEOLATUS, D.C., CRIMSON FLOWERED BOTTLE-BRUSH.—To travellers by tram, coach, or motor from Manly to Narrabeen, numerous bushes of these showy plants, covering many acres of the marshy land lying between the road and the ocean, display, in the flowering season, normally October to January (though this species, as is the case with much of our Australian flora, is somewhat irregular in this respect), quantities of gorgeous blooms presenting a magnificent blaze of colour for which one is at a loss to find a parallel, the massed beds of the flaming *Salvia* in our parks and gardens providing an indifferent comparison. In a minor degree the same sight may be witnessed in a swampy patch abutting on the Grand Drive near the Randwick entrance to the Centennial Park. In the latter case, the brilliant colour of the flowers is tempered by the sombre hue of the fronds of a creeping fern (*Gleichenia dicarpa* R. Br., a relative of the "Umbrella-fern," *G. flabellata*, R. Br.), whose tangled masses cover the surface of the swamp. The flower spike of the Callistemon is composed of a number of flowers cylindrically arranged on the stem, the colour being supplied not by the petals, as is usually the case, but by the stamens, which stand out boldly from the small flowers, thus creating the resemblance to the household article which provides its popular name.

There are, and this is one of the disabilities of common names, a number of plants whose appearance and habits are very dissimilar, with flowers called "Bottle-brushes." The *Banksias,* also known as "Honeysuckles," members of the "Waratah" family (*Proteaceae*), several "Tea-trees" (*Melaleuca*), and most species of *Callistemon,* are known by this undiscriminating title, and I would here venture a plea for the use of botanical names wherever practicable. In a few outstanding cases, such as the "Waratah," "Flannel-flower," "Christmas-bush," and "Christmas Bell," the common name has become so widespread and well established that the flowers represented by these names are generally known, but in many cases the alleged common name is decidedly uncommon, frequently duplicated, known only to a limited circle in a circumscribed area, and generally misleading. The "Native Rose" is quite as well known under its botanical name *Boronia,* the scientific name of the exotic Bouvardia does not appear to be a stumbling block, and even the Japanese national flower Chrysanthemum is known by its somewhat lengthy botanical title, though a name a little longer, but otherwise very similar, *Mesembryanthemum,* is baulked at, and the ridiculously inappropriate name of "Pigs-face" substituted. While admitting that some of the common names at present in use cannot be dispensed with offhand, as for many people they are the only guide to the plants represented, I contend that young Australians should be taught to know their flora and fauna by the only nomenclature which acknowledges neither racial nor geographical boundaries.

NOTES AND COMMENTS.

EUCALYPTUS IN EUROPE.—In a recently published work, entitled "Old Calabria," Mr. Norman Douglas indulges in some rather amusing diatribes on the Eucalyptus in Europe. He states that the introduction of this tree has disfigured the whole Mediterranean basin. He speaks of it as an "eye-sore," a "grey-headed scarecrow," a "reptile of a plant," whose "horrible metallic rustling chills one to the marrow" like "the sibillant chattering of ghosts." He asserts that it has proved worse than useless as a guard against malaria, as its "scraggy foliage" fosters the disease by harbouring clouds of mosquitoes. He thinks the oil has no value, and is only considered medicinal because it is nasty.—(*Chemist and Druggist.*)

THE LATE DR. T. S. HALL.

It is with great regret that we note the death of Dr. T. S. Hall, of Melbourne University. Dr. Hall was well known in connection with the Australian Association for the Advancement of Science, as Secretary and Editor of the Proceedings of the Victorian Meetings, and acted as Zoological Secretary on the occasion of the visit of the British Association. A highly appreciative account of Dr. Hall's life and work, written by his colleague, Professor Baldwin Spencer, appears in the January number of the *Victorian Naturalist,* every word of which we heartily endorse.—Ed.

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JOURNAL AND MAGAZINE OF THE NATURALISTS' SOCIETY OF NEW SOUTH WALES

Edited by THOS. STEEL, F.L.S.

The Author of each Article is responsible for the Statements and Opinions expressed therein.

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OF NEW SOUTH WALES

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Publication Committee—The President ; Hon. Editor ; G. A. Waterhouse.

The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

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Excursions are held monthly on the first Saturday Afternoon in each month unless otherwise notified.

NOTICES.

Meeting: July 4th, Education Building, Loftus Street. Lecture by Mr. A. S. Le Souëf, " "Animals of Australia, with Notes on Variation." Illustrated by lantern slides.

Excursion: July 8th afternoon, to "Bonito," Queen's Crescent, Croydon. Mr. and Mrs. Froggatt cordially invite the party to afternoon tea.

Annual Meeting: August 1st. Presidential address by Mr. W. W. Froggatt, F.L.S.

Members exhibiting specimens are particularly requested to hand a list of exhibits to the Secretary. Friends cordially invited to meetings and excursions.

THE
Australian Naturalist.

VOL. III. JULY 4, 1916. PART 11.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

4th April, 1916.—Mr. W. W. Froggatt, F.L.S., President, in the chair, and 50 members and visitors present. Misses Annie Hastingden and Ethel Turner, and Monsieur Chayet and Mr. A. E. Watson were duly elected members.

Rev. J. Oberlin Harris read an interesting paper on "Silk Culture."

The Hon. Secretary announced that he had received three designs for the outside cover of *The Australian Naturalist,* which would be dealt with by the Committee appointed to make the selection.

Mr. Shiress exhibited a flower-spike from a *Callistemon,* a hybrid raised by Mr. Cheel from *C. acuminatus* and *C. lanceolatus,* at present flowering in the Botanic Gardens, and remarked that whilst the foliage of the plant represented the staminate parent, *C. lanceolatus,* the flower-spike, which was eight inches in length, took after *C. acuminatus,* the mother plant.

Mr. Cheel contributed a note on a specimen of *Vitex luteus,* exhibited by Miss Hinder at a previous meeting. The plant, which is a native of North Island, New Zealand, is prized as producing the most valuable hardwood in that Dominion. The mechanism for securing pollination is one of the most interesting and remarkable adaptations of floral structure to the habits of honeysucking birds that has so far been noticed in the New Zealand flora. Particulars are given by D. Petrie, M.A., in a very interesting paper in Trans., New Zealand Inst., Vol. xxxvii. (1914), p. 409.

Mr. A. A. Hamilton exhibited a panicle of flowers of *Humea elegans,* a herbaceous biennial, with stem-clasping leaves and bearing large pendulous sprays of diminutive red flowers. *Santalum obtusifolium,* with its blue-black berries, from Audley, National Park, *Heli-*

chrysum rutidolepis, a mountain variety. He also gave an interesting account of the staminate and pistillate flowers of the three local species of *Caustis*, and notes on *Arthropteris tenella* (J.Sm.), (*Polypodium tenellum,* Forst). The genus, *Arthropteris,* was established by J. Smith to contain *A. obliterata* (R.Br.), *A. tenella* (Sm.), and *Nephrolepis trichomanoides* (Sm.). Hooker followed Smith's classification, Bentham agreed with Forster, and was followed by Moore and Betche. The genus has now been restored by Christenson, the latest authority on Filices, and will contain two species only, *A. tenella* and *A. obliterata, Nephrolepis trichomaniodes* being sunk as a synonom of the latter. *Nephrolepis cordifolium* and *Davallia pysadate* and *D. dubia* were also commented upon.

Mr. Froggatt exhibited a gall produced by *Apromorpha Fletcherii,* a fine series of this remarkable coccid, which produces large swellings on the branchlets of the Box (*Eucalyptus*). The true cylindrical oval chambers containing the yellow top-shaped coccids, enveloped in a floury secretion, are embedded in the aborted woody tissue beneath the bark. To the ordinary observer the presence of the coccid gall would not be noticed, as the apex of the gall is just level with the surface of the bark and often covered with dry flakes.

When the bark is removed the upper portion or cap of the gall comes away with the bark, out of which it is apparently formed, and from which it is easily detached, as a little hard cone with an apical orifice. There may be half-a-dozen or more of these hidden galls in one of the lumps of aborted woody tissue. The specimens shown were collected on a tree on the banks of the Murrumbidgee near Hay, New South Wales.

2nd May, 1916.—The chair was occupied by the President, Mr. W. W. Froggatt, F.L.S., and about 40 present.

The Hon. Secretary announced that the Selection Committee had awarded the prize for the cover of *The Australian Naturalist* to Mr. H. Zeck.

On the motion of Mr. Finckh it was decided to set apart a table for members to exhibit any Natural History specimens which they wished named or to exchange, donate or sell.

Miss Bayfield exhibited a spider taken from a lemon tree, having a remarkable bag-shaped egg case. Mr. Shiress, a specimen of *Pavonia hastata,* a representative of the Malvaceæ, raised from seed collected at Wiseman's Ferry, and producing Teratological flowers, showing Neiophylly or suppression of the corolla. Mr. D. G. Stead gave a most interesting account of his voyage to Europe during war time, and particularly of the wonderful work performed by the trawlers in mine destruction in the North Sea.

FIELD NATURALISTS.

By W. W. Froggatt.

[Address delivered at opening night in Education Department Hall, November 2nd, 1915.]

Ladies and gentlemen, fellow-students in the fields of Nature with work and pastime that keeps us young in heart, for a nature-lover never grows old, for example, I would ask you to remember the late Mr. Garland, who took as keen an interest in our work up to the time of his death as he did as a field botanist in the Wagga district, where I first met him over thirty years ago.

Thus our lives go on, and I should define the religion of a Field Naturalist as the cheeriest and brightest conception of a great Creator Who does not leave anything to chance, but slowly through the ages evolved the forms of the humblest plants and animals that we find in their perfection to-day; Who formed our great coal measures; the great cliffs of Hawkesbury sandstone, grain over grain, and sent our rivers onward to the sea. To-night marks a new departure in the history of this Society, as we come into closer touch with the Department of Education, and hope to be of more use to the Nature Study students that are working in the Department, as well as to all the school teachers in the State.

I have, at the suggestion of your Council, put together some notes, giving a brief account of the development of Field Naturalists' Associations in Australia.

In such a virgin land as New South Wales we had Field Naturalists at a very early date, such as John W. Lewin, who published his observations, accompanied by coloured drawings of our insects and birds, in 1805; Robert Brown, the botanist; Messrs. John Gould and Gilbert; Dr. George Bennett, and Mrs. Meredith, of Tasmania. The first scientific society formed in Australia was the Philosophical Society, in 1821; the Tasmanian Society followed in 1838; and the Victorian Institute in 1854. The Philosophical Society of Victoria came into existence in 1855, but these last two Societies amalgamated and became the Royal Society of Victoria in 1856.

I mention these Societies because most of the members were not so much scientific men as nature-lovers and Field Naturalists.

In the Macleay Memorial Volume Mr. Fletcher says: "The working Zoologists of the colonies in these early days, however, were from the nature of circumstances never very numerous, and their work at first was more or less that of Field Naturalists, for their efforts in other directions were insuperably hampered by the want of books and of reference collections, as well as by want of leisure and by their isolation."

For a very interesting resume of the early natural history of New South Wales, I would refer you to the introductionary portion of the Macleay Memorial Volume, written by Mr. J. J. Fletcher.

The study of natural history received a fresh stimulus when the late Sir W. Macleay and his friends formed the Ent. Society of New South Wales, in 1862, which lived till 1873, and produced two volumes of Transactions, covering the work of its members between these dates, 1862-73.

Later in the following year (1874), Macleay again inspired his friends with his enthusiasm for natural science, when they met together and formed the Linnean Society of New South Wales.

I might here just say a few words in regard to my good friend, and the great work that Sir William Macleay did in advancing the study of natural science in Australia. We can all claim this big-souled man as a true Field Naturalist. Through the medium of the Proceedings of the Linnean Society, all our naturalists were enabled to publish the results of their observations. He formed the Macleay Museum, and sent out collectors (of which I had the privilege to be one) all over Australia to add to his collections, and gave specimens to workers in all branches of natural history to study and describe. It was not so much the original work he did himself, and that was considerable, that he will be remembered by, as it was the helping hand he gave to everyone willing to take up his beloved study; and his monument is the endowment of the Linnean Society and its Fellowships.

Everyone of us, when looking back, can call to mind the influence some person has had upon our lives in opening up new lines of thought and making a turning point in our life; and I, looking back through the records of the *Victorian Naturalist* the other night, came upon the obituary notice of Richard Henry Nancarrow, 1889. Though I had great advantages in having a father and mother who took a keen interest in natural history, and had a box of beetles among my treasures as a very small boy, it was environment that made me a bush naturalist. Living on the outskirts of the town of Bendigo, Victoria, we school boys spent most of our Saturdays roaming over the ranges and gullies of the whipstick scrub. It was on the edge of the whipstick scrub that Nancarrow had a quartz reef, which he worked with his brother, and in his spare time studied the wonders of the bush land. He took an interest in the bush-loving boy, and was the first bush naturalist who helped me. He was a remarkable man; he could call all the birds out of the bush round him; he painted the wild flowers; he collected all kinds of specimens and corresponded with authorities of the Melbourne Museum and Bendigo School of Mines, and was an original member of the Field Naturalists' Club of Victoria.

This was the first Field Naturalists' Society, and was founded in Melbourne in 1883; its first reports were published in the pages of the *Southern Science Record,* the first volume of the *Victorian Naturalist* appearing in April, 1885.

An important event took place in 1888, when the first meeting of the newly-formed Australian Association for the Advancement of Science was held at the University of Sydney. In spite of its formidable name, it gathered in all our Field Naturalists, together with the specialists in all branches of science. It did a great deal in bringing together people with kindred thoughts from all the Australian States. In the list of the first Council Mr. Thos. Whitelegge's name appears as representative of the Natural History Society of New South Wales, which had been formed the previous year.

The Field Naturalists' Society of New South Wales, of which the present one may justly claim to be the descendant, was formed in 1890, with Dr. George Bennett as Hon. President, and Mr. J. H. Maiden, as President. We held our meetings in the School of Arts, and at our Annual Meeting in 1893, had an exhibition of natural history specimens, which was open to the public for three days at St. James' Hall. We published "Olliff's Australian Butterflies," "Wooll's Plants of the County of Cumberland," and a bulletin on collecting and preserving specimens. The Society, however, fell on evil days, and was disbanded shortly after the exhibition.

The year 1890 was an important one to scientific workers, and marks the time when the pioneers in New South Wales were dropping out and a new generation was coming forward. Professor Stephens and Baron Miklouho Maclay died; the Rev. Tennison Woods had completed his last journey and returned from Java, and Sir William Macleay had given up descriptive work on account of ill-health.

While some of the older men still contributed to the Linnean, a new band of workers had appeared. Mr. Skuse, who had been monographing the Diptera of Australia in the Macleay Museum, had joined the staff of the Australian Museum. Mr. Sloane had contributed his third paper on the Australian Carabidae; Mr. Meyrick was publishing his fourth paper on the Australian Moths; Mr. Misken was working at the Butterflies; and Mr. Maiden his first paper on Economic Botany. Among other contributors to the Linnean in that year were Messrs. Olliff, Musson, Fletcher, Etheridge, Maskell, and myself, Drs. Blackburn, Woolls, Prof. Haswell, and Baron von Mueller.

The completion of Master's Catalogue of the Australian Coleoptera gave the beetle men something to go upon in arranging their collections, and we began to work out and name our collections in a systematic manner.

This year also saw the establishment of the Department of Agriculture, with the appointment of a scientific staff, to deal with the botany, chemistry, and insect and fungus diseases of plants.

The sub-department of Forestry followed with a Director and an Experimental Nursery at Gosford. The Technological Museum formed country branches at Goulburn, Maitland, Newcastle, and Bathurst.

I have no need to say much about our existing Field Naturalists' Society. It was chiefly owing to the energies of our late President and first Hon. Secretary (Mr. G.

A. Waterhouse) that it rose from the ashes of the old Society, and to Mr. Brazier that we collected its assets.

This Society, in its fourteen years of activity, has never gone backward, and though some of our old members have dropped out, we have always had some one to steer the ship, and a band of workers that have been ably assisted by our enthusiastic secretaries, Messrs. Waterhouse, Gurney, Edwards, Cheel, and Shiress.

We have, I think, spent many pleasant evenings together, and our bush tramps have brought kindred spirits together and cemented many friendships.

There are in the other states Field Naturalists' Societies, the father of them all, the Field Naturalists' Club of Victoria, founded in 1883. The Geelong Field Naturalist Club formed in 1897, issued the *Geelong Naturalist* in the same year; but two years later, it was merged in the journal issued by the Gordon College, under the name of *The Wombat*, which in 1899 returned to its original name of the *Geelong Naturalist*.

The Naturalist History Society of Western Australia, originally called itself the Mueller Society of Western Australia, and is now the Natural History and Science Society of Western Australia. The Field Naturalists' Club of Queensland issues a journal, *The Queensland Naturalist*. The Tasmanian Field Naturalists have their headquarters at Hobart, and have a large muster, and camp out every year. The Northern Field Naturalists are located at Launceston.

Every new Field Naturalist added to our ranks, either in the town or country, is another centre for the spread of Nature Study. The Field Naturalist can often brighten the life of the dwellers out-back, for the surroundings of the bush man and bush woman are full of natural wonders, in spite of their monotony, to which their attention only needs to be directed; then every tree has its story, every waterhole or creek is a home of quaint life, and something has its hiding-place under every stone or fallen log. The little bush track through the sliprails leads to a fairyland, when once we began to unravel Dame Nature's story, from which the traveller never turns back once he has taken the road.

During the course of the year I get many letters from valued correspondents from all parts of Australia, and it is one of my privileges, as an officer of the great Department of Agriculture, to exchange information with all sorts and conditions of men. There are many Richard Nancarrows, in their own quiet way, helping on the thought of the world, just as there are others like Sir William Macleay who have made the best use of their wealth in scientific investigations.

There is no greater power for good in the land than the country school teacher. Who but he can mould the thoughts of little children and give them advantages that their fathers and mothers very often never had?—and the more he can show them of the wonders of nature the more contentment he can bring into their lives, and keep his memory green long after he has gone. Who can estimate the value of the work that our friend, Mr. A. G. Hamilton, has done in spreading Nature Study investigations among the young school teachers?—for every school teacher we can enlist in our ranks is not only a gain to this Society, but also to the Department of Education.

After the end of this awful war, with every newspaper and magazine piling up the horrors with pen and picture, there will be, let us hope, a happier time, when people will return to nature, and, just as after the devastating Napoleonic wars of the last century, a reaction took place. With "the piping times of peace" that followed, art, literature, and science again appeared with renewed vigor, even the pastoral poets like Wordsworth, Cowper, Southey, and others reflected the restful minds of the nation. So will we have a revolution in thought with the passing of war and hate from our hearts, just as the earth will hide her scars with the sweet green grass waving over the remains of our noble dead. Our Empire workers will turn to thoughts of tolerance, love, and peace, and again take up the work of bettering the conditions of life for all classes, in which scientific research will play an important part.

In conclusion, I would quote the following lines by Dean Albert W. Smith, an American writer:—

The sunshine floods the fertile fields
  Where shining seeds are sown,
And lo! a miracle is wrought:
  For plants with leaves wind blown,
By magic of the sunbeams' touch,
  Take from the rain and dew,

And earth and air, the things of life,
  To mingle them anew,
And store them safe in guarding earth,
  To meet man's hunger need.
Then lo! the wonder grows complete,
  The germ within the seed
Becomes a sermon or a song,
  A kiss or kindly deed.

THE QUEST OF CALLISTEMON LOPHANTHUS.

By D. W. C. Shiress.

Breakfast at 4.30 a.m., paper train 5.30 a.m., found Messrs. Cheel, Bott, and the writer speeding into Mittagong from Hill Top—off the chain. To a stranger the paper train might appear casual, and although it left us rods off the Mittagong Station, we were too eager for the journey ahead of us to mind trifles; and as we swung along the main thoroughfare of that charming little township, and settled into our stride, we soon forgot paper trains as we left the world behind us.

The Berrima Road is lined with useful Eucalypts, and it seems a pity that the Shire Councillors do not make an avenue of such beautiful trees as *Sieberiana* (Mountain Ash), "*amygdalina*," "*corymbosa*," and "*dives*," which grows by the wayside. *Corymbosa* was in full bloom, and although we noticed a few "Honey Eaters," the absence of birds was very marked, only a Butcher Bird and a distant Magpie were singing their morning song of thanksgiving. All the world was gay, however, and it was glorious drinking in the ozone of the mountain air—crisp and sharp—walking was a pleasure. The rain of the past week had freshened the earth, and a plentiful supply of fungus growths were noticed. One of the party was busily engaged eating mushrooms, and was sorely tempted to try a *Boletus granulatus*, a golden beauty, found under some *Pinis insignis* by the wayside. Our fungus authority, Mr. Cheel, remarked how this Boletus was prized by the French, and if its flavour was on a par with its size, then a fortune awaits the successful cultivator.

At the turn off to Jellore Creek, 2½ miles from Mittagong, one of the sudden changes from shale to sandstone is met with, and here one finds himself back to the Sydney flora again. *Eucalyptus haemastoma* (Scribbly Gum), *piperita* and *capitellata* being the prevalent types of the family Eucalypt, with a sprinkling of *Acacia decurrens* Var *mollis* thrown in. *Oxylobium cordifolium* is first met with, then the pretty *Helipterum calvertianum*, *Grevillea bauera, montana,* and *triternata; Persoonia feruginea, Pultenea scabra* Var *bilobatum, Goodenia barbata* and *hederacea; Brachycome gramminfolium, Commersonia echinata, Epacris paludosa, Leucopogon virgatus, Stypandra glauca* in profusion, and *Craspedia Richea,* although very few were in flower.

Passing through a grazing farm we skirt the hills, taking a short cut to Fraser's. *Eriochilus autumnalis* was very plentiful in the fields, it being the only ground orchid we noticed. We were fortunate in finding *Hakea leucoptera* and *Casuarina paludosa* in some marshy ground we crossed. This ground was covered with Sneeze Weed, *Myriogyne minuta,* and the surrounding country with "Centaury," *Erythraea australis.* Next, passing through a decayed plantation of *Acacia decurrens* (evidently Var *mollis*), we catch sight of Fraser's, and some fine Box Trees, *Eucalyptus hemiphloa,* which by some miracle have escaped the axe.

Taking another short cut we pass through Fraser's clearing on to Chance's, past a fine "White Top," *Eucalyptus Smithii,* and the cap of Mt. Jellore is seen. The view from Chance's is one of beauty and joy for ever, and is worth the walk alone.

Mt. Jellore is residual and practically isolated, and to get at it we have a downhill walk of a mile, descending 2,000 feet into Jellore Creek, where the nettle flourishes—enthusiasm fails—and there is but water to drink.

Mitchell, the surveyor, observed the mount from Goulburn, and made it an observatory, living on the peak for six months. He has left a topographical sketch of the surrounding country, also a well-defined track up the western side. Two rabbiters we met advised us to make the ascent along a spur which had been cleared to provide feed for sheep, but our course lay along the bed of the creek much further round, and so we zig-zagged from the base until at about 2,000 feet elevation we found the lost sight of *Callistemon.* *C. lophanthus* has been recorded from the Jenolan Caves, Mount Nelligen, the Grampians in Victoria, and has a close relative in Tasmania in *C. pallidus.* Mr. Cheel discovered it on Mt. Jellore two years ago, but, being pressed for time, did not mark the spot, and last October we tried to locate it, but without success. Like many mountain plants it is extremely conservative, for it is found in possession of an area less than a quarter-acre in extent, and was growing on a ledge of rocks, eight plants in all being seen. Some 20 feet below the ledge was a most seductive carpet, and although the writer searched every inch of the ground, not one young plant could be seen, greatly to our disappointment. Very old fruits were noticed and gathered, and it may be that, like *C. acuminatus,* upon which I have noted some very old fruits, it requires a bushfire or a falling limb of a tree to free the fruits from the stem, and thus relieve the captive seeds.

The plants were about 7 feet high, unsymmetrical, with alternate small ovate leaves pitted all over with prominent oil dots. Having secured a plentiful supply of fruits and cuttings we negotiated the rest of the climb with well-filled Vasculums and light hearts.

The flora of the mount is, in a sense, disappointing. On the lower slopes large patches of *Indigofera australis, Senecio lautus,* and *Helichrysum elatus* were seen; whilst the ubiquitous nettle was everywhere. In sheltered spots *Adianthum formosum, Blechum discolor,* and *Chielanthus tennuifolia* (very luxuriant) represented the Filices, and *Dendrobium striolatum* and a *Liparis,* the Orchids.

Goodenia ovata was noticed all the way up. Solitary trees of *Sterculea diversifolia* and *Elaeocarpus cyaneus,* with an occasional *Acacia pennivervis;* whilst as we ascended, *Eucalyptus tereticornis* and *capitellata* got more stunted in growth. The summit, which is hardly an acre in extent, was covered with *Casuarina stricta,* a few stunted trees of *C. suberosa,* and that charming bush, *Westringia eremicola,* had a few lingering flowers, and wonder of wonders, *Acacia glaucesens,* which appeared to clothe the whole of the northern side of the mount right on to the summit. This river-loving Acacia has thus made a record, and proved the saying "that it is always the unexpected that happens." However, there is plenty of material here for theories. The remains of a well, evidently a relict of Mitchell, would make it appear that occasionally sufficient rain falls to give a temporary store of water.

The view from the summit well repays the climb. The country to the Blue Mountains reminds one of the billows of the sea, wave after wave of cliffs, 2,000 feet in depth, marking the different watercourses feeding the Nepean. We could distinguish the outlines of Mts. Wilson and Hay to the north, whilst to the south, towards Goulburn on the tableland, patches of cultivation amongst the sombre tints of the Eucalypts. Descending by Mitchell's track we slide and slip at the expense of shoe leather, passing a fairly strong growth of *Westringea eremicola*, a *Lasiopetalum*, which, owing to the absence of bloom, we could not determine—our coastal friend, *Correa speciosus* and *Zieria cytisoides*—until we get on to a ridge where the walking is easy enough in the long grass along sheep tracks. Our final descent into Jellore Creek was productive, as Mr. Cheel discovered *Sticta* (*Stictina*) *crocata* growing plentifully on a large fallen rock. *Goodenia ovata* was gay on the banks of the creek. We noted some fine trees of *E. punctata* and a heavy growth of *Acacia decurrens* Var *mollis*, which is so frequently mistaken for *Acacia decurrens* Var *nomalis*, as we know it, and planted for the bark crop, to the confusion and discomforture of the grower. I really think something should be done to warn people against *mollis*, which flowers twice a year, and can frequently be seen with both flowers and fruit, whilst *decurrens* proper blooms only in October.

Jellore Creek was beautiful, and having found a suitable spot, we rested our "ponies" within arm's length of the rippling stream and enjoyed the cold water so much that we did not care to spoil it with tea. Whilst resting and "blowing the cool tobacco cloud," our eyes were gladdened by a visit from a Robin Redbreast, who came quite close to take stock of us, flew away, and returned immediately with a young cock robin. It was then that we wished all our bird lovers were with us, for Mr. Red Breast flew down to the water's edge within three feet of us, and having satisfied himself that it was a suitable place for a bath, called Master Red Breast down and gave him a bathing lesson, totally ignoring the proprieties and oblivious of the fact that there was a "chiel amang us takin' notes."

It is astonishing how trustful the wild birds are, and at the same time how curious the smaller ones. We had a 2,000ft. climb ahead of us and a 7-mile walk afterwards, so leaving Jellore Creek with several regretful sighs, we resumed Indian file and turned our faces homewards. I am no good on a homeward march. The fact that I am leaving Robins and stately Eucalyptus behind leaves me a long way in the rear, and I walk listlessly along until I am roused to action by Mr. Cheel calling to me to go to the right. I wonder why, but obey, and am repaid for my obedience by the sight of a Clematis in all its glory of full seed. I wonder how many have seen such a sight, for, beautiful as the Clematis is in full flower, its glory pales before the masses of beautiful snowballs the seeds form, before they are freed to blow as the wind listeth.

As we returned to civilisation, Mr. Cheel proudly and carefully carrying a large *Polyporus Hartmannii,* and discussing its properties, is accosted by a boy on a fat pony who, with youthful ardour, says, "Hey, Mister, that ain't a mushroom!" It was kindly intentioned of the boy, and daresay, if he still thinks of the "new chum" he rescued from a fearful death, he wonders why we all laughed so heartily.

Once more on the Berrima Road we stop to admire *Leptospermum flavescens* Var *grandiflorum,* which we noted in the early morning. It stands alone in its family, with its graceful habit and wealth of large pure white flowers. One cannot but remark on the indifference shown to our native plants when arrested by such a striking thing as *grandiflorum;* probably the fact that these can be gathered by the wayside is responsible for this indifference, and unless the florists are asked for these plants, they will remain in the background until they disappear from off the face of the earth. We were fortunate in securing six fruits from a plant, being determined to make an effort to perpetuate it.

How different the country looked from the morning! A beautiful sunset clothed the hills with purple, and one could not help thinking of Longfellow's beautiful poem, "The Day Is Done." Certainly a feeling of sadness and longing came o'er us, as we retraced our steps and left so much behind us. One of those days that just happens as if some fairy had "Kenned us a'" and lifted the veil for a peep into wonderland. No wonder the sunset was purple.

INTERESTING PLANTS FROM FAIRFIELD.

By A. A. Hamilton.

On the reserve by the side of the railway-line the weedy, ubiquitous, *Helichrysum apiculatum,* D.C., and its equally widespread relative, *Vittadinia australis,* A. Rich., were noted, both of which are distributed by the agency of the wind, the fluffy pappus on the seeds (achenes) being blown about like thistledown; *Desmodium varians,* Endl., with its peculiar pod, so constricted between the seeds that each portion at maturity separates from its neighbour and becomes a separate entity (article); *Chenopodium carinatum,* R.Br., a member of the "Goose-foot" family of Britain, and the Salt-bush family of Australia; and numerous grasses and weeds (for which the railway reserves are a nursery), grown from seeds scattered by passing railway trucks. Entering the bush, which consists chiefly of "Tea-trees," *Bursaria spinosa,* Cav. ("Black-thorn"), etc., typical of flat Wianamatta shale country, a "Mistletoe," *Loranthus miraculosus,* Miq., was noted on its customary host, *Melaleuca parviflora,* Lindl. This species was named *L. melaleucae,* by Leuhmann, because of its partiality for that genus as a host plant. The berries when ripe are pale pink, deepening into red, succulent, and viscid, and the leaves of this form are much narrower than those of *L. pendulus*, Sieb., under which species it is placed in Moore's Handbook; *Vernonia cinerea,* Less., of which two forms were seen, one glabrous, with purple florets, the other hairy, with white florets; *Epaltes australis,* Less., whose presence is an indication of sour, ill-drained land. On the banks of George's River the "Water Plantain," *Alisma plantago,* L., was found, with its large panicles of somewhat insignificant flowers standing well above the broad, strongly-veined leaves; *Cladium mariscus,* R. Br., and *Cyperus trinervis,* R.Br., two somewhat rare Cyperaceous plants (the latter is not recorded in Woolls' list). In a waterhole near by, the aquatic *Damasonium australe,* Salisb. with its floating leaf lamina, and flexuous flowering stems, carrying the peculiar beaked fruiting carpels, with horizontally spreading rays, "Star-fruit," was noted.

EXCURSION TO KILLARA, DECEMBER, 1915.

The members of the Club walked from the Railway Station to the Lane Cove River, and on the way examined and collected flowers and insects. On the *Angophora,* amongst commoner specimens, was noticed the rare large elongate, heavily-bodied fly *Apiocera,* belonging to the family *Apioceridae,* resembling the Robber Flies (*Asilidae*), of which Williston says there are under 20 species known in the world, and the larvae are as yet quite unknown. We have two species of this family here on the East Coast of New South Wales, viz., *Apiocera bigotii* and *A. asilica.*

Of the beetles there were examples of Cetoniides, several Cleridae, and such small forms as Mordella and Phyllotocus. Also there were several species of Stigmodera, but again the fact is brought home to us that the numbers of Stigmodera, or longicorn beetles in particular, which some 10 years ago were so plentiful in similar adjacent bush in the newer suburbs, are not nearly so plentiful as regards number of species and individuals. The Buprestidae and Longicorns are tree-borers in their larval stages, and two or three years are required for these boring grubs to become full-grown and pupate. These species are therefore perhaps the first to be eliminated, whereas possibly the root-feeding Lamellicorns and leaf-eaters, such as Paropsis, escape destruction more readily.

At the butt of a wattle tree several clusters of Bag-shelter moth ova were discovered, each cluster consisting of a hundred or more eggs fastened together by a secretion, and the whole covered by scale-like hairs from the tip of the abdomen of the female moth, which lays the eggs. Hence these are called "Brown-tailed moths," and the eggs were those of *Teara,* a species whose caterpillars form those striking columns which pass across the ground from tree to tree, known as Processional caterpillars. On the wattle and gum trees they feed on the foliage at night, and construct a silken bag, which is the common home or shelter by day of the whole of the group of caterpillars. Specimens of *Callistemon rigidus* were gathered probably from the site whence R. Brown secured and named the plant.

W. B. GURNEY.

NOTES AND COMMENTS.

THE RAT KANGAROO.—*Polorous tridactylus*, Kerr, has long been known to collect grass for nest-building purposes, and to carry it in its prehensile tail, but very little has been recorded as to the exact method of procedure. The following notes, based on a specimen in captivity, are therefore of interest:—

When collecting material for nesting purposes it does so in a most systematic manner. The animal squats on all fours in front of the grass, and slowly raises its hindquarters to allow the tail to curve beneath the abdomen. After taking the grass in its mouth, it places it in the fore paws, and thence back to the under surface of the in-turned tail. These actions are repeated until the mass becomes dishevelled and bulky, when the rat raises its hind leg, and with an inward turn of the foot, presses or kicks the grass into a tidy parcel. In bringing the tail to the rear again the grass is gripped and rolled into a compact mass, with which the animal hops off, apparently unhampered by the load it carries behind.

HARRY BURRELL,

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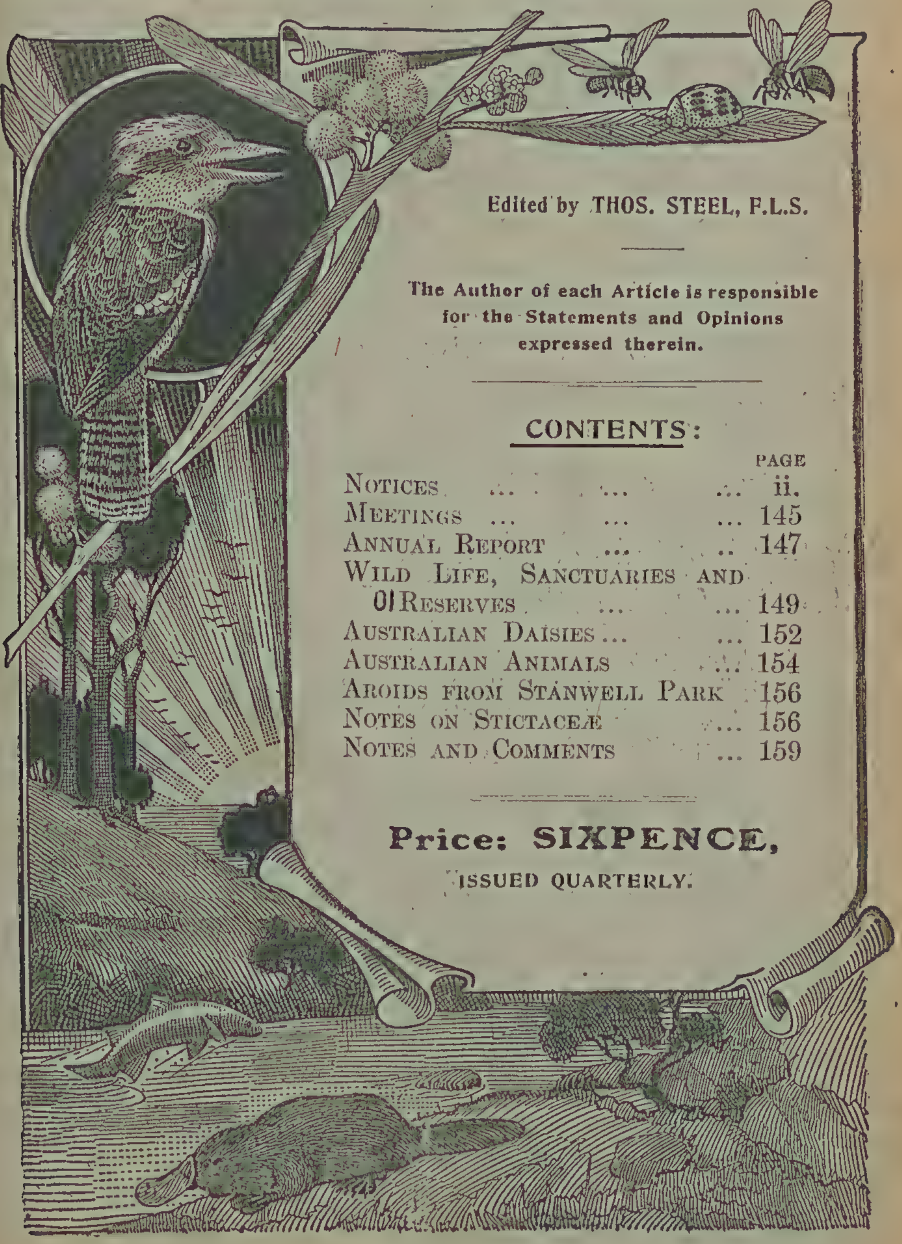
THE AUSTRALIAN NATURALIST

JOURNAL AND MAGAZINE OF THE NATURALISTS' SOCIETY OF NEW SOUTH WALES



Edited by THOS. STEEL, F.L.S.

The Author of each Article is responsible for the Statements and Opinions expressed therein.

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OF NEW SOUTH WALES

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The object of the Society is to bring together both ladies and gentlemen throughout the State who are at all interested in Natural History, and by Mutual Aid, Meetings, Papers and Exhibits, and practical work in the field, to encourage students of all ages, and so advance in every possible way the study of Natural History.

Annual Subscription—Adults, 7/6; Juniors (under 18 years), 2/6; Country Members, 4/-.

NOTICES.

Meeting: October 10th, Education Building, Loftus Street. Lecture by Mr. Dudley Le Souëf, of Zoological Gardens, Melbourne, "The System of Bird Life." Illustrated with lantern slides.

EXCURSIONS.

October—Hornsby—"Pond Life," Mr. R. J. Tillyard, M.A.
November—Mount Penang (All Day).
December—Heathcote (All Day).
February—Marine.
March—Glenbrook.
April—Easter Excursion.
May—"Geology," Mr. E. S. Edwards, M.A.
June—Zoological Gardens, Taronga Park.

THE

Australian Naturalist.

VOL. III. OCTOBER 3, 1916. PART 12.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

6th June, 1916.—The President, Mr. W. W. Froggatt, in the chair, and about 40 present.

On the motion of the Hon. Secretary, it was agreed that a committee, consisting of Messrs. E. S. Edwards, M.A., C. H. Wickham, and Miss Le Plastrier, be appointed to organise the monthly excursions.

Mr. Shiress drew attention to a male of *Monophlebus Crawfordi*, a mealy bug coccid, collected at Hornsby, and its resemblance, in miniature, to a Bird of Paradise. Mr. A. A. Hamilton, a series of botanical specimens collected at Port Hacking during the Easter excursion. Mr. Wickham, the larvæ of a cup moth (*Lymacodidae*), hair moss collected at Gordon, and a fine series of the flowers of *Cobea scandens*. Mr. L. Gallard, a finely displayed series of useful and destructive insects. Miss Froggatt, a stick insect (*Extatosoma tiaratum*), on rose bush, illustrating protective coloration.

The President invited discussion on the nomenclature of the Australian birds in Gregory Matthews' work, recently published. In this work, which has been followed by some ornithologists, the old genera have been cast out in a most reckless manner, and great numbers are treated as sub-species, with a third or sub-specific name. Thus, our well-known Little Masked Swallow, which we know as *Artamus personatus*, now masquerades under the new name of "*Cambellorinus personalus munia.*" The Spotted Bower Bird, *Chlamydera maculata*, has "*Macdonnella*" added to its name. Our common Magpie, *Gymnorhina tibicens*, has *intermissa* tacked on. He pointed out the hopeless muddle such indiscriminate renaming of the birds would cause, and hoped that none of our ornithologists would follow the cumbersome and unnecessary alterations to the present binomial classification. Mr. Le Soüef added some remarks, and generally agreed with the speaker.

Mr. Cheel gave a most interesting description of a fine series of individual capsules of 69 distinct species of Eucalypts, with a view to showing how the structure of these may be used as an aid to determination of species. Mr. Cheel's remarks will be published under "Notes and Comments."

4th July, 1916.—Mr. W. W. Froggatt, President, in the chair, and about 60 present.

Mr. A. S. Le Soüef gave what proved to be one of the most interesting lectures delivered this year, on "The Animals of Australia, With Notes on Variation," and illustrated his remarks with lantern slides and live specimens.

Mr. A. A. Hamilton exhibited two interesting Aroids from Stanwell Park, and a series of interesting ferns. Mr. L. Gallard, specimens of a moth (*Zeuzera sp.*), and described its operations on the root of the Turpentine Gum; also a carrot, showing fasciation, with eight "fingers." Mr. Cheel contributed notes on "Natchnee" or "Wimbi Grass." Messrs. Le Soüef and Abrahams were duly appointed Auditors for the year.

ANNUAL MEETING.

1st August, 1916.—The President was in the chair, but owing to the stormy weather, only about 30 members were present.

The following were elected members:—Misses E. Bowie, F. Collins, B.Sc., and Sharland, Messrs. H. Ellen and J. Quin. The Annual Report of the Council was read and approved. The Treasurer's Balance Sheet was submitted and adopted.

The office-bearers, as per list on cover, were duly elected.

The retiring President, Mr. W. W. Froggatt, then delivered his Address on "The Protection of Wild Life, Sanctuaries, and Nature Reserves," which was followed with keen interest by all present. After a hearty vote of thanks to Mr. Froggatt, the new President, Mr. A. A. Hamilton, was installed in the chair, and congratulated by Mr. Froggatt, who said that Mr. Hamilton's valuable botanical work was highly appreciated by the members. Mr. Hamilton returned thanks for the honour bestowed upon him.

Votes of thanks to the office-bearers, and particularly to the Hon. Treasurer and the Hon. Lanternist, for their very special services, were carried by acclamation.

ANNUAL REPORT.

In presenting the Fourth Annual Report for the year ended 31st July, 1916, your Council has pleasure in congratulating the members on the very satisfactory position of the Society.

The great war which has raged for the past two years has left its mark on us, though less from a financial than from a personal standpoint. Some of our members have nobly responded to the call of the Empire. whilst others have lost loved ones in the cause of Liberty, and to these the Council extends its heartfelt sympathy.

In spite of the general upheaval, our membership has been well maintained. and the Society is in a sound financial position. This has been possible only by the camaraderie of the members—by that invisible link. the community of thought; and also by a desire to rise to nobler things for the benefit of our fellow-workers.

Twenty-two members were enrolled, whilst we lost an equal number by resignations. With the exception of January, monthly meetings have been regularly held and well attended. the attendance averaging forty-four.

The following lectures were given, and we have again to thank the lecturers for the care shown in the choice of subjects and the willing spirit in which the lectures have been given:—

"Insects Associated With Acacia Decurrens," by Mr. L. Gallard.

"The Physical Side of Osmosis," by Mr. F. W. Carpenter, M.Sc.

"The Rise and Progress of the Society," by Mr. W. W. Froggatt, F.E.S., F.L.S.

"The Sugar Cane," by Mr. Thos. Steel, F.L.S.

"Some Native Plants and Their Visitors," by Miss Agnes Brewster.

"Silk Culture," by "Rev. J. Oberlin Harris.

"Impressions of a Naturalist During War Time," by Mr. D. G. Stead, F.L.S.

"The Animals of Australia, With Notes on Variations," by Mr. A. S. Le Soüef.

Two members' nights proved a great success, and your Council hopes to set another night apart for the benefit of the younger members.

Excursions were held at Loftus, Lane Cove River, Deewhy, Killara, Heathcote, Fairfield, Taronga Park, National Herbarium, and were well attended. The Easter excursion was held at Port Hacking, twenty-two members attending.

Through the courtesy and goodwill of the Under Secretary for Public Instruction, to whom we again tender our best thanks, the Society has received recognition at the hands of the Education Department, and at the same time has the use of this fine Assembly Hall "free of charge." This latter has enabled your Council to enlarge our paper, a fact which should bear good fruit.

The Library has been enriched by a gift of some valuable works, through the generosity of Mrs. Garland, the widow of our late and revered member, Mr. J. R. Garland. Our books are to be catalogued with those of the Education Department, and very shortly members will have daily access to them.

An Outing Committee has been formed to control our excursions and to draw up a syllabus for the year. It is to be hoped that members will do all in their power to assist the committee to make a success of this departure, and that the pages of "The Australian Naturalist" will benefit thereby.

A design for the outside cover of the "Australian Naturalist," by Mr. H. Zeck, appeared for the first time on the last issue. A prize was offered for this, for the express purpose of encouraging members with artistic tendencies.

Your Council decided to publish "A Catalogue of the Plants of the County of Cumberland," to be edited by Mr. E. Cheel. This entails a considerable amount of work, and it will be a little time before this much-needed catalogue is completed.

The thanks of the Society are due to Mr. Cheel for his generosity in undertaking this valuable work.

As you are aware, from patriotic motives, the sum of £50 was invested in the war loan during the year.

Our thanks are due to Mr. Thos. Steel, F.L.S., who has so ably edited our paper, "The Australian Naturalist," and done so much to popularise it.

THE PROTECTION OF WILD LIFE, SANCTUARIES, AND NATURE RESERVES.

(*Summary of Mr. W. W. Froggatt's Presidential Address*)

In the opening portion of his address, the President gave a brief review of the Game and Wild Birds Protection Acts that have been passed at different times in the Australian States. He pointed out that all the earlier laws were simply Game Acts, and that not until quite modern times were any clauses added to protect insectivorous birds even in the breeding season. Victoria and New South Wales were the first States to take the lead in enlarging the scope of their Game Acts, and now all over the greater part of the civilised world Wild Bird or Wild Life Protection Acts have replaced the old Game Acts. In most of the Australian States the existing laws and regulations are sufficient to protect our native fauna. but to a very great extent they are dead Acts, as it is no one's special business to see that they are properly administered. The fauna should be protected under three headings. First, useful birds from their value as destroyers of insect and other pests; secondly, all harmless birds on account of their beauty; thirdly, game birds and animals on account of the commercial value for food, furs, and skins. Mr. Froggatt pointed out that there was no private ownership in the wild life of the country; it was a valuable asset belonging to the whole community. and that while the man on the land was quite at liberty. and his rights were recognised. to destroy noxious birds and animals damaging his crops, the indiscriminate slaughter and thus final extinction of the unique birds and animals that it has taken uncounted ages to evolve, and which once gone can never be recalled, is a crime we are committing against unborn generations.

In 1901, schedules of lists of Australian and foreign birds were drawn up in our Birds Protection Act by someone in authority, which were simply a jumble of names of birds, some of which did not at the time exist in New South Wales. Four years later this list was properly revised; but it is even now simply a list of popular and scientific names that would be of little use to anyone laying an information against a person shooting protected birds. The Wild Life Protection Society have had an amended Wild Life Protection Act printed twice and placed before the members of the House. If passed into law, this Bill would simplify the whole thing, as it proposes a close season or absolute protection on all birds and animals that are not pests, and in its schedule only gives the names of the pests. It goes further: we propose that when a bird becomes a pest in a district, it can be scheduled as a pest in that district without interfering with it in other districts where it is harmless. Such birds as crows, wood swallows, honey-eaters, and bee-birds are serious pests in some localities; but in others are not only harmless, but valuable destroyers of insects. The attention of thinking people has been turned to the immediate importance of doing something to stop the destruction of bird and animal life that, with the advance of settlement, is going on all over the world; and the creation of sanctuaries has been the chief practical solution of the question of effective preservation of wild life.

A sanctuary is a tract of waste land, inland lake, marshes, swamp, coastal estuary, or forest land in its original state, "where man is passive and Nature is active." In New South Wales at the present time, though there is quite a long list of so-called sanctuaries given at the end of the Game Act, the only two that are actual sanctuaries are the National Park and Kuring-gai Chase, with a few small reserves under more or less supervision at Jenolan and a few other cave reserves. A writer has said: "In itself, a sanctuary is a kind of wild 'Zoo' on a gigantic scale and under ideal conditions. As such, it appeals to everyone interested in animals, from the greatest zoologist to the mere holiday tourist. The strongest of all arguments is that sanctuaries, far from conflicting with other interests, actually further them. Only a certain amount of animal life can exist in a certain area. The surplus must go outside. So sanctuaries are more than wild 'Zoos'; they are overflowing reservoirs, fed by their own springs, and feeding streams of life at every outlet."

The Progress Associations of the Blue Mountains and other tourist resorts could do valuable work in protecting wild life, and add to the beauty and charm of their districts if they would only prosecute any person shooting within their districts.

There are many areas in New South Wales that should be absolute sanctuaries for the breeding up of game birds and wild fowl, the protection of our large kangaroos, native bears, and opossums, such as the Reed Beds of the Lachlan, where countless thousands of our valuable Ibis have their nesting-ground, the Macquarie Marshes, many of our inland lakes, all the coastal estuaries near Sydney, and the head waters of our coastal rivers.

In other States and countries private landowners have, with Government aid, dedicated such places on their estates as sanctuaries, and it is an example that could be well followed by some of our wealthy squatters. Under proper supervision, both private and Government sanctuaries would become the overflow breeding-ground for countless thousands of ducks, geese, other waterflowl, game, and birds of all kinds, and game would be as plentiful and as valuable source of food supply as our fish.

As regards the game birds, there is no reason why this overflow of life, bred out from the protected areas, should not be turned into food. No one claims that our fish should be protected and not utilised; it is no more cruel to shoot or trap game under proper regulations than catching fish for food. This is a view of the question that is often lost sight of by the sentimental bird-lovers who, like the followers of Buddha, would take no life, forgetting that the absolute protection which they advocate would result in such an abnormal increase that birds and animals would overrun the country as pests or die from starvation.

All persons who shoot wild game for sport or profit should pay a license fee to the Government for the right to shoot game and fur-bearing animals. A gun license might be unpopular, but it is a very fair and equitable tax if levied upon shotguns and sporting rifles (and would save many boys from untimely death through pea rifles). An export duty upon all skins and furs would bring in a large revenue. The money thus obtained would be ample to pay for the supervision of all sanctuaries and Nature reserves in the State.

As regards Nature reserves, they would not only be sanctuaries for birds and animals, but under proper management, would attract Nature-lovers from all parts of the world, and soon pay for their maintenance, as they do in other parts of the world. A brief review of sanctuaries and Nature reserves in the other States, and an account of what is being done in the way of Wild Life Protection in other parts of the world, was given, and the address was illustrated with a fine series of lantern views.

AUSTRALIAN DAISIES.

By A. A. Hamilton.

The Australian members of the Daisy family, represented by the genus *Brachycome*, are worthy of the favourable attention of the horticulturist. *B. diversifolia*, Fisch and Mey, has, as the specific name indicates, variable leaves, ranging from simple on the stem to the much divided leaves of the basal rosette, similar to those of the "Marguerite Daisy," *Chrysanthemum frutescens* L. This species is usually found in cool elevated situations; specimens collected by the writer were obtained near the top of Blackheath Glen, but it is more strongly entrenched in the southern sub-alpine regions in the neighbourhood of Kiandra, Cooma, Yarrangobilly Caves, etc. An interesting reference to the eminent botanist, Robert Brown, occurs in the following note on this species in Edward's Bot. Reg., t. 1025, where it is figured under *Pyrethrum diversifolium Grah*:—"That it is not a *Pyrethrum* is evident, but we willingly leave it to be determined by Mr. Brown, from whom alone any useful information respecting the New Holland *Compositae* is to be expected." A further note, *loc. cit.*, is as follows:—"It is stated by Dr. Hooker to be an annual, but we believe it will prove to be a perennial." The experience of the writer is that the plants are biennial, or at most, triennial. After the second season they commence to deteriorate, the foliage becomes coarse, the stem woody, and the flowers smaller and fewer. *B. nivalis*, Fv.M., from Mt. Kosciusko, has delicate fern-like leaves, and is probably the prettiest of the "Snow Daisies," though it has several rivals. *B. stricta*, D.C., is a somewhat shrubby plant, with conspicuous flowers, found in the coastal area; a patch of plants of this species grew on the roadside between Manly and Narrabeen, near Deewhy. There are several other species more or less worthy of cultivation, all of which, together with those previously mentioned, have white flowers. The blue-flowered "Swan River Daisy," of Western Australia. *B. iberidifolia,* Benth., is already a well-established garden favourite, though the white-flowered form of this species is not so frequently grown. In a description of this species, in Curtis' Bot. Mag., t., 3876, the following reference is made to the colour of the flowers:—"The variety of colours exhibited by flowers obviously of the same species in the Swan River colony is quite extraordinary, and is a frequent subject of remark by Mr. Drummond in his observations on the botany of that district.'" (Drummond collected and sent to Kew and other European establishments seeds, and numbered sets of botanical specimens from Western Australia. Many of the specimens became types, and are quoted under Drummond's numbers by Bentham (Fl. Austr.) and other botanists. A lengthy list of plants dedicated to him by various authors, together with much interesting information concerning him, will be found on p. 14, *Records of Australian Botanists,* by J. H. Maiden.) Both *B. iberidifolia* and *B. diversifolia* have been cultivated in British gardens for more than half a century. All the species enumerated are hardy in the Port Jackson district, the adaptability to varying environmental conditions in this group being especially marked. Although much of the native vegetation is undoubtedly intractable, there are many notable exceptions. A striking example of the adaptability of certain species might, a few years ago, have been observed in the native flower border at the Centennial Park, where "Snow Daisies" from Mt. Kosciusko, *Hibiscus tiliaceus,* L., from the northern rivers, and "Salt-bushes" from the Western Plains, were growing side by side. Many of the *Brachycomes* form clumps, which may be divided in the same manner as those of the common garden daisy, *Bellis perennis,* L., but the majority are prolific seed-bearers, and grow so freely from seeds that division of the off-sets is hardly worth practising. The inadvisability of the use of stimulants in the cultivation of indigenous plants is occasionally advanced, but this group is certainly benefited by a generous supply of well-rotted manure.

AUSTRALIAN ANIMALS.

By A. S. Le Souef.

The Australian animals consist of marsupials, rodents, and bats, with one canine representative—the dingo. On account of their ancient type, interest is chiefly centred in the marsupials. These are very circumscribed, being sharply divided from the Asiatic animals by Wallace's line, running east of New Guinea. The Cuscus extends into the Celebes, and is in evidence in some of the large islands extending east towards America, where two families of marsupials are also found. On account of our animals being nocturnal, they are very unobtrusive, and beyond the kangaroos and wallabies, are seldom seen by the casual observer; but it is very instructive to take a walk through the bush with an aboriginal, whose training fits him to read the signs of the forest or plain like an open book. I can remember such an excursion in the Dorrigo. Our guide, an intelligent aboriginal called Billy Jo, was well acquainted with the district, and the abode of an opossum was easily found from scratches on the trees. A small hole 40 ft. up a smooth, dead tree was declared to be inhabited, as flies were round the entrance, and investigation revealed two small pouched mice (*Phascogale*). A leaf sticking out up another tree denoted the "lay up" of the large flying squirrel (*Petauroides*).

The fresh bark stripped off a Eucalyptus gave clue to the nest of a Ring-tail Opossum, a bunch of leaves in the crevice of rock contained another Phascogale, whilst a slight mound of grass was the home of a Rat Kangaroo.

It is interesting to note how similar in form most of our marsupials are to much higher types of animals of similar habits found in other parts of the world. Thus our Phalangers are like the lemurs in shape, size, and colour, and have much the same colour variations; this is especially so in the case of the Vulpine Opossum and the Mongoose Lemur. The Jerboa Rat (*Conilurus*) closely resembles the Jerboas of Europe and Africa. The Pouched Mice (*Phascologale* and *Sminthopsis*) are similar in external appearance to the ordinary mice and rats of the genus *Mus*. The Tasmanian Wolf (*Thylacinus*) is very dog-like, while the Tiger Cat (*Dasyurus*) resembles the Civit Cat. The balance of wild life in Australia has been very much upset by introduction of foreign predaceous animals, such as the cat and the fox, and also by settlement. The animals mentioned are making a clean sweep of our small ground fauna, most of which have quite disappeared from districts where they were once numerous.

This especially refers to the Native Cat and the Rat Kangaroos, but it is interesting to note that the Native Cat and one of the Bandicoots are numerous round Sydney, and from this it would seem that the Fox is their especial enemy.

The clearing of the land kills off the native animal inhabitants, but has the effect of concentrating the predaceous birds in the timber belts, and the inhabitants thereof have a much harder struggle for existence. Recently while visiting the Riverina I noticed that Boobook Owls were very numerous in the groups of trees left for stock shelter.

It is pleasing to note how quickly our animals respond to protection. On Wilson's Promontory, in Victoria, which is reserved as a National Park, and closely guarded, the Native Bear (*Koala*) is almost too numerous and is eating out the eucalyptus; while on our western plains, where the kangaroos are not hunted, they become very plentiful, and have periodically to be killed off. In the park lands round Sydney Harbour, Bandicoots (*Peramelidae*) are in hundreds. Our animals show variations in colour, according to environment. The coastal districts produce gray or black individuals; in the dense scrubs of the eastern coast, and the sombre forests of South-West Australia, the opossums are black, in the open forests they are gray, and in the dryer districts show more or less brown colouration, ranging from a rufous tint on the shoulders to a dark, even, rufous all over; in north-eastern Queensland the colour is sometimes bright foxy-red, with a white breast. In the Red Kangaroo of east-central Australia, the males are red and the females grey (though not invariably); but in Central and Western Australia this is often reversed, especially in the white-throated variety (*Macropus occidentalis*). All our larger marsupials are very prone to albinoism, and the white specimens breed true. A group of white kangaroos was established in the Melbourne Zoological Gardens. Several white nail-tailed kangaroos were bred in Sydney, and Mr. H. L. White, of Belltrees, has a race of white opossums.

The pouched mice and smaller flying phalangers, bandicoots, etc., have an economic value in that they are insectivorous, and assist in keeping insect pests in check.

A great deal yet remains to be done in studying the habits and life-histories of our animals; little has been done in this direction, and I would appeal to anyone who has the opportunity not to lose any chance of adding to our knowledge of the subject.

AROIDS FROM STANWELL PARK.

By A. A. Hamilton.

The following are notes on two interesting Aroids from Stanwell Park, viz., *Typhonium Brownii*, Schott, and *Gymnostachys anceps*, R.Br., "Settlers-flax." In the family Aroideæ the inflorescence normally consists of two series of unisexual flowers, accompanied by a number of neutral organs, variously arranged on a spike (*spadix*), the latter usually enclosed in a spatha, of which the large white floral envelope of the "Arum," or "Calla," Lily, *Richardia africana*, Kunth, is an example. The spatha of *T. Brownii* is naturally a dull flesh colour, but is evidently susceptible of improvement by cultivation, as a coloured plate in Curtis' Bot. Mag., of a plant grown at Kew, delineates a spatha of a rich, glowing purple. The true flowers are insignificant in size, the pistillate ones placed at the base of the spadix, a series of neutral organs immediately above, and a bare interval of about an inch between the latter and the staminate flowers. *G. anceps*, the only representative of a genus which is endemic in Australia, differs from the typical Aroid in two important characters. In the place of an individual spadix, it possesses a series, and instead of the usual prominent coloured spatha, a scarious bract, minute when present, but frequently undeveloped, subtends the spadices.

NOTES ON STICTACEÆ.

By E. Cheel.

In 1772, John Reinhold Forster and his son, George Forster, both well-known botanists of their days, left the shores of England with Captain Furneaux, who was in command of the "Adventure," which accompanied the "Resolution," under Captain Cook's command, during his second voyage to these latitudes. Among other plants collected by the Forsters were five lichens; these were numbered 584-588 respectively.

In those days very little was known of lichens as representing separate genera, except the divisions created by Dillenius in his "Historia Muscorium," published in 1741, which include his three genera, namely, *Usnea* (under which he included a number of what we know now as Parmeliaceæ); *Coralloides* (which included *Bolomyces, Cladonia, Ramalina,* and other genera of modern workers); and *Lichenoides* (which included a great many forms, recognised now as distinct genera distributed among several families).

One of the five lichens collected by George Forster is described and figured by George Francise Hoffmann, in "Plantæ Lichenosæ" (1790-1801), under the name *Platisma filix.* This is No. 584 in G. Forster's herbarium, and is recorded by him in his "Florulæ Insularum Australianum Prodromus," 1786, under the above number. In Hoffmann's work the genera and species are divided chiefly by the structure of the thallus, very little attention being given to the apothecias or receptacles which bear the spores, which are analagous to seeds, and considered by modern workers to be the most important structures of the plants in the classification of lichens.

Modern workers in lichenology have accordingly revised all the earlier records of lichens, including those of Hoffmann's work, and we now find his *Platisma filix,* originally collected by George Forster in these latitudes and registered in his work under the number 584, under the name *Sticta filix.*

The various species of lichens included under the name *Sticta* are more or less marked on the under surface of the thallus or fronds, with little pits or minute excavations, which no doubt prompted the generic name for these plants, which are the largest and most showy of the lichen family, and have been termed by earlier writers the patricians of the lichen flora.

The name is probably of Greek origin, derived from the word "Otlktos," which means spotted, in allusion to the gibbi, cyphellæ or pseudocyphellæ, as the spots above referred to are technically called.

During the past fifty years there has been a remarkable change in the classification of lichens, and much controversy owing to the dual nature of the plants, as it has been definitely proved that the general structure is composed of two distinct elements—a fungus and an algæ. Some writers have advanced the theory that these compound organisms have entered into a mutual arrangement, which is termed symbiosis, or, in other words, a kind of consortism; while others contend that all hypotheses of mutualism or consortism between the lichen and the symbiotic alga are erronous, and that the lichen is a fungus pure and simple.

If we accept the latter view, it will be seen that the relation of the lichen—fungus to the lichen—alga is purely biological, and is of the utmost importance, as all plants are classified according to their fruits or reproductive organs, and that in the case of these plants, the systematic position in the vegetable kingdom depends upon the lichen-fungus.

In a microscopic examination of the tissues of the thallus of stictaceæ it has been found that the chief families of the algal hosts, on which the lichen-forming fungi prey, are those commonly known as chlorophyll-green algæ, grouped under the family Palmellaceæ, and the blue-green algæ, grouped under the family Nostoccaceæ. Other races or families of algæ, which have been detected in the tissues of stictaceæ, are Protococcaceæ and Pleurococcaceæ. For example, in the section *Ricasolia* of the genus *Lobaria*, the algal or gonidial-layer of the thallus consists of *Protococcus*. In the section *Knightiella* of *Lobaria*, the algal-hosts are chiefly Csytococcus. In the section *Lobarina*, of the genus *Lobaria*, the algal-hosts are chiefly *Polycoccus*.

On account of the difference of these algal-hosts, the lichens of the sections *Ricasolia*, *Knightiella*, and *Lobarina*, have been raised to generic rank.

In the same way, we find in the section *Stictina*, of the genus *Sticta*, blue-green algal-hosts, chiefly belonging to *Polycoccus punctiformis*, whereas in *Sticta* proper they are bright green or yellowish-green Palmellaceæ, algæ, hence, *Stictina* is regarded by earlier lichenologists as a distinct genus.

It will be seen from the above that lichens are a very complex group of plants, and as the world's lichenological flora has been divided into forty-seven distinct families, and that in Stictaceæ, which is not by any means the largest family, there are upwards of 400 species or subspecies and varieties, the study of these lowly plants is not very simple.

In the various works that I have consulted, I have been able to ascertain that there are about 175 species of this family recorded for Australasia. They are usually found on decaying logs or living trunks of trees, or on mossy rocks in the deep gullies or gorges of our mountainous country. In New Zealand and Tasmania the tree-trunks in the dense forests are usually covered with these plants. In the brush gullies of the coastal districts, such as are seen at Bulli Pass and Otford, some fine specimens may be collected. A few species may also be found in the deep gorge at Waterfall and in some of the deep gullies of the National Park.

A list of the species, showing their distribution in Australasia, is being published in the "Australasian Association for the Advancement of Science"; parts I. and II. have already appeared in the journal for May, 1912, p. 254, and December, 1913, p. 311, respectively.

NOTES AND COMMENTS.

THE EUCALYPTS.—The following are remarks by Mr. Cheel in connection with his exhibit of capsules of eucalyptus:—A complete list of names had been compiled from Bentham's "Flora Australiensis," Mueller's "Eucalyptographia," Maiden's "Critical Revision," and Baker and Smith's "Researches," as well as from papers by various workers in the Proc. Linn. Soc., New South Wales, and Royal Soc., New South Wales, which amounted to 498 names, inclusive of those given to forms, varieties, or species. This is a formidable list to grapple with, and as the list of names is still on the increase, it is a big task to be able to identify a given tree or colony of the same kind of trees. The various species have been classified into groups or sections, according to the shape or other characters of the author. The leaves have also played a part in the grouping of the species, but as the juvenile stage of development is so different to the adult, and as the adult leaves are so variable even on the same tree, it is not an easy matter to identify any given tree.

The bark has also been used in a popular way as a means of identification, but this again is so variable in its character as to be of little use in grouping even closely allied species. The character of the fruits seems to be the most natural, and the old saying, "By their fruits ye shall know them," seems in the case of the Eucalypts to be perhaps the most useful single means of identification. A series of individual fruits of the corymbose section shows very clearly how the different species, as *calophylla, ficifolia, corymbosa; eximia, maculata,* are closely related to one another, and that these can be identified from their individual fruits when typical mature fruits are used.

BAECKEA VIRGATA, Andr.—A species which might readily be mistaken for a Leptospermum, as its large white flowers simulate those of the latter genus. The impression created by this superficial resemblance is further accentuated by the size of the leaves, which are larger than those usually found in the New South Wales members of the genus. It is a brush-forest habitue, a lover of shade and moisture (*hygrophyte*), and may be collected in the deep mountain gorges at Leura, Wentworth Falls, etc., and in the rich forest lands of Southern Illawarra.

A. A. HAMILTON.

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RECEIPTS.		DISBURSEMENTS.	
To Balance	£117 5 9	By Rent	£7 0 0
Subscriptions ..	56 19 0	Printing Journal ..	13 12 9
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Edited by THOS. STEEL, F.L.S.

The Author of each Article is responsible for the Statements and Opinions expressed therein.

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NOTICES.

EXCURSIONS.

February—Marine.
March—Glenbrook.
April—Easter Excursion.
May—"Geology," Mr. E. S. Edwards, M.A.
June—Zoological Gardens, Taronga Park.

THE

Australian Naturalist.

VOL. III. JANUARY 2, 1917. PART 13.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

10th October, 1916.—Mr. A. A. Hamilton, President, in the chair, and about 56 present.

The following were elected members:—Misses Collingridge and Buckler, Mrs. McDonald, Messrs. H. E. Crane, M.A., H. Reid, and G. W. Steinbeck. The President announced that owing to the serious illness of Mr. W. H. Dudley le Soüef, of Melbourne Zoological Gardens, his lecture had to be held over. On the motion of Mr. Froggatt, it was decided to send Mr. le Soüef a letter of sympathy.

The President announced that the Council had appointed Mr. Froggatt, Mr. Shiress, and himself as Delegates to the conference of Scientific Societies, to arrange to approach the Government to provide Nature Reserves and Sanctuaries for our Native Fauna and Flora. Mr. W. W. Froggatt exhibited a fine series of specimens of the genus *Lamprima*, with notes on their habits. Mr. W. B. Gurney, an Australian Bombycid, *Pinara despecta,* a large handsome reddish-brown moth, which spins a large cocoon attached to the leaves of gum-trees. Mr. A. A. Hamilton, specimens of four species of *Cassinia,* from Cook's River, with remarks on geographical distribution and environment; two species of *Scirpus,* demonstrating differentiating characters; *Boerhaavia diffusa,* a useful dry-country fodder plant; and *Linaria elatine* (Toad flax), a British hedge and road-side weed, the latter two collected in the railway yard at Clyde. Mr. Hamilton also showed a series of ferns, representing the genus *Asplenium,* with notes on fructification.

7th November, 1916.—The President, Mr. A. A. Hamilton in the chair, and 40 present.

Mr. Watson exhibited a series of shells from sand taken from a bore in Middle Harbour at a depth of 100 feet. The President, some rare forms of Epacridaea, with notes on habits and distribution; also mounted specimens of New South Wales ferns, representative of the genus *Asplenium* (Spleenwort).

Dr. S. J. Johnston gave a most instructive lecture on "Snakes and Lizards," illustrated with lantern slides. He was accorded a very hearty vote of thanks.

5th December, 1916.—The President, Mr. A. A. Hamilton, in the chair, and 30 present.

Mrs. Alexander and Mr. Percy Matthews were duly elected members.

The President referred in feeling terms to the death of Mrs. Finckh, mother of our esteemed Honorary Treasurer, and a special vote of sympathy was passed.

Miss Mabel Brewster exhibited a cluster of cocoons of the Fiddler Beetle (*Eupoecila australasiae*), and read a life-history of the beetle. Miss Agnes Brewster gave a most instructive description of the Coral tree (*Erythrina indica*) and its method of adaptation to our climate.

On behalf of Miss Irby, of Casino, Mr. Cheel exhibited floral specimens and read a delightful description of the natural features of Burringbar Mooball, on the Tweed River.

Mr. Finckh, living specimens of aquatic plants, including *Nitella*, showing flowers and fruit, and gave an instructive account of the best method of dealing with young fish in ponds. Miss Steenbeck, opalized wood.

Mr. E. Cheel gave an interesting lecture on "Myxies" (Myxomycetes), illustrating his remarks with specimens collected in New South Wales, and exhibited at the Science Congress held in 1914.

SOME BIRDS NOTICED ON THE SOUTHERN TABLELAND.

By D. W. C. Shiress.

Have you ever sat in the early morning and watched that graceful yet silent beauty, the Rock Robin (*Origma rubricata*), with his dainty red-brown dress on, searching along the edges of the rocks for his breakfast, whilst overhead the rustling of the noisy inquisitive Honey Eater, the Spine Bill (*Acanthorhynchus tenuirostris*), makes you imagine that all the birds in Christendom have been let loose, as he darts with erratic motions after the gnats in the tree-tops, for there is no honey yet, and he must eat to live till the spring brings him his flowers with the nectar; a Coachwhip bird (*Psophodes crepitans*) in the gully cracking his whip, and a Lyre bird (*Menura superba*) close at hand, whistling and playing pranks with all the bird calls; the white-browed Scrub Wren (*Sericonis frontalis*), like a swarm of bees about you, curious, yet withal watchful of your every movement; and the white-checked Honey Eater (*Meliornis nigra*) (*sericea*), with his silky yellow and black coat, lending a touch of colour to the surroundings. It is a good cure for the nerves if you have them. The white-eared Honey eater (*Ptilotis leucotis*) is also watching you, and a white-throated treecreeper (*Climacteris scandens*) is pretending he does not see you as he climbs round and round, calling to his mate that apparently you are harmless—until you sneeze, as you inevitably will, and then, like the barrel organ man, you have to move on and seek fresh fields and pastures new. It is a good thing too, for you get into another bird world and become again a living statue. The noisy chattering black Magpie (*Corcorax melanorhamphus*) appears, squabbling because there is so little for breakfast; then our old friend, the black-backed Magpie (*Gymnorhina tibicen*) discusses you with his mates, and ends up his summary in his well-known flute-like song. Unfortunately both these birds are often the victims of man's desire to try how his gun shoots, and are not as tame as they otherwise might be.

By a liberal use of chopped-up meat, the Magpies will frequent your quarters, and it is interesting to watch them through the open door, and observe how human they are in their treatment of one another, for it is eat all you can and fly away with what the other fellow desires. Two Crow Shrikes (*Strepera fuliginosa*) are so like the Magpie that you thing you have discovered a new variety: lemon-coloured eyes, black-pointed beaks, and white in the wing and tail feathers, being your guide to identify them. In observing the birds, you soon become aware of two things—firstly, that you require an unlimited stock of patience; and secondly, that the birds have well defined ranges, so that in a place like Hill Top, with its ravines and beautiful gullies, given the time to spare, you are always noting something new.

Blackguard Gully and Rocky Creek, both within easy distance of the railway station—one surrounded by an amphitheatre of rock and the other typically named, apart from their bird inhabitants, are well worth a visit, for everything is on the grand scale. At the head of Rocky Creek, the sandstone cliffs on the northern side afford an excellent home for the Martins, and the marshy ground on the south side of a feeding-ground "par excellence," for these insectivorous birds. The Swallow and White Rumped Wood Swallow (*Artamus leucogaster*) are to be found here in plenty. Jacky Winter (*Microeca fascinans*) has also chosen this spot for a home, the only one about Hill Top proper. The beautiful yellow Robin (*Eopsaltria australis*), with his gazelle-like gaze clearly saying I know you will not hurt me; (*Pardalotus punctatus*), the daintily-marked Diamond Sparrow also ignores your presence (sure sign that they are not shot at). The harmonious thrush (*Colluriclincla harmonica*) is also calling to his mate, and some Crows flying home to roost warn you that your mission here is ending for the day.

Blackguard Gully gives you a restless Fly-catcher not figured in Leach—feeding over a vast bed of *Callistemon lanceolatus.* A scarlet-breasted Robin (*Petrioica Leggii*) and a hen Lyre-bird feeding round the rocks, whilst in the gully her mate is making the echoes ring.

An eight-mile walk to the Nattai River, at the back of Colo Vale, doesn't give you much time for noting the birds. The Spine Bill is caught in the act of punishing some Tit Warblers with his cruel beak, and is henceforth looked upon with suspicion. The Wood Pigeon is heard cooing in the bush, but not seen; they are very timid, as they are shot at sight. A flock of Galahs herald your arrival at the brow of the Nattai Valley, and you sit and uncover your head at the sight at your feet.

Some Magpies are feeding in the clearing beneath you, for your path is down 2,000 feet, and about an hour's walk through a fertile clearing, a patch of volcanic soil contiguous to Mount Jellore. Patches of *Melaleuca sty-*

pheliodes afford shelter to the superb warbler, the Blue Wren (*Malurus cyanochlamys*), a flock of Red Heads (*Aegintha temporalis*), and the yellow-tailed Tit Warbler (*Acanthiza chrysorrhoea*).

The Peewit (*Grallina picata*) has an excellent field for his strong wings, and the imported Starling is also to be seen there, making believe that he is a songster. A Magpie flies gracefully off a dead tree-top and volplanes to his mate some 200 yards away; so graceful is the action that you feel quite envious as you stumble along the rough ground.

The King Parrot (*Aprosmictus cyanopygius*) and Rosella (*Platycercus eximius*) squabble at the edge of the clearing, but delight the eye as they fly like red shafts of light through the tall timber.

At Mittagong the usual town birds are to be observed. Jacky Winters, the restless black and white Fly Catcher, Willy Wagtail (*Rhipidura motacilloides*), and on an Acacia rubida, on the banks of a dam called Lake Alexandria, a white-naped Honey Eater (*Melithreptus atricapillus*) a real beauty, well-repays your visit. Mention must here be made of Acacia rubida, which was in full flower, the leaves and stems having their Autumn tints still lingering, the appearance from the distance being a solid golden mass. The writer was fortunate enough to have a good look at a Coach Whip Bird whilst searching down a Gully for *Passiflora Herbertiana*.* Oh, ye birds, beautiful birds, rich in plumage and song, with the flowers, what would our woods be without you! but why, oh why, did they give you such awful uncanny names? No wonder Fabre protested so much about the names of his insects, and yet an effort is being made to adopt the trinomial system instead of trying to simplify the names. The purely scientific side of the question interests but few; a bird can be picked to pieces at any time, and to those who are inclined to make variations, I would recommend the common house sparrow as a most excellent field for the working off of surplus energy. Whilst one must acknowledge the necessity for the use of a common language in the scientific naming of any group of natural history, the haphazard way the birds have been named and cut up leaves much to be desired. By all means re-classify them, it is necessary; but the use of common-sense in so doing is more vital than that of dog-Latin or Greek.

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* *Phosphodes crepitans* is the name he is known by.

THE EASTER EXCURSION.

Those of our members who chose to spend the Easter at Simpson's Hotel, Port Hacking, will have many pleasant recollections of the beauty of the district, of the excellent collecting on the seashore and the surrounding hills, and of the splendid arrangements so kindly and ably made for their accommodation and transport by Mr. Wickham. Whether Mr. Wickham ordered the weather or not was a subject of dispute, but it certainly fitted in with his programme. The district is most suitable for every collector, the marine ones especially so, for there is rocky ocean and river foreshores, shelving beaches and mangrove swamps. Mr. Hedley's admirable article on the "Ecology of Sea Beaches" was of great assistance, and the members freely expressed the hope that he would some day publish a text-book, illustrated by his experiences, about Sydney Harbour, the Hawkesbury, and Port Hacking.

Good Friday was spent in the more immediate vicinity of the hotel. In the morning, Mr. A. A. Hamilton led a botanical party, and in the afternoon the members did marine work along the shore. Each day some definite work was done, and the concluding trip to Marly on Easter Monday was a fitting ending to a most successful holiday.

Saturday was spent at Deer Park, on the Port Hacking River. A launch conveyed the party there, and some good collecting was done. Mr. Carpenter and his assistant put in a strenuous afternoon as cave inspectors, hunting for wingless ant lions. Some good botanical work was done by the party, and Miss Wickham, in a heroic effort to kill a bulldog ant, unearthed an ant lion larva of extraordinary size. No one of the party had ever seen one in any way approaching it in size.

Sunday morning found the party making its way along the beaches towards the Heads, in order to see some remarkable aboriginal carvings on one of the headlands.

In this they were aided by a local fisherman, and certainly the carvings were distinctly fine specimens of Aboriginal work. The afternoon on the heights above the hotel was a very enjoyable one. The party saw an unlimited number of ant lion holes on the tracks. The trip to Marly on the coast, on Monday, was a delightful experience, and some of those who looked on the sand-dunes there by the sea saw an illustration of the wind-blown formations which are so strong a geographical feature along the coast from Sydney. The Aeolian theory of the origin of the Hawkesbury sandstone has no supporters to-day, but it is possible that the winds have played a very important part in their formation. It was a great pleasure to be joined in our Marly expedition by an old friend, Mr. Gurney; the members have pleasant memories of his leadership and help on many a bygone excursion, and the welcome he received was a warm one.

Mr. A. A. Hamilton, who provides the botanical report of the excursion, did yeoman service. He assisted each evening in naming and describing the botanical specimens collected during the day, and those who slept in the big attic of the hotel have pleasant recollections of his descriptions of many places and of unusual experiences in many strange regions of the world.

To Mr. Wickham we are greatly indebted for the organisation of the excursion. He made many good entomological finds, and assisted the party greatly. His efforts to keep the lodgers in the attic physically healthy and clean by a regular dip in the cold salt sea each morning were greatly appreciated—by all the rest of the party.

Miss Mabel Brewster made some good finds: the life-history of *Donans,* from egg to butterfly. Cotton weed (*Gomphocarpus*) was plentiful, with swarms of aphides on them, which were being devoured by lady-bird larvae. She discovered the nest of the wasp, *Polistes Tasmaniensis,* under a rock ledge, almost at sea-level, and various gall insects.

The spikes of the grass trees were in many cases riddled with borers, and many of these pests had paid attention to the *Casuarinas* down on the sea margin.

There were few butterflies in evidence, but *Tisophone abeona,* the wood-brown butterfly, was seen with rather battered wings, probably the last of the season.

Miss Mabel Brewster also supplied a most interesting account of Crickets and their playful ways. A fuller account will be given in *The Naturalist* later on.

Miss Brewster, Mr. Carpenter, and others gave much assistance. Socially the excursion could not have been more successful, and when the members parted on Easter Monday evening, it was with regret that so enjoyable a holiday had to be put away with the pleasant memories of the past.

E. S. Edwards.

BOTANICAL NOTES OF THE EASTER EXCURSION TO PORT HACKING.

The flora generally is that of the southern sea coast; the solitary representative of the north coast Flora noted which had survived the climatic change was a Composite, *Enhydra fluctuans,* a straggling beach-swamp habitue collected at Marly Beach. A tangled thicket of these plants was observed by Miss A. Brewster scrambling among the Cyperaceous growth; and Miss Austin noted the somewhat obscure flowers, partly hidden in the axils of the leaves or the forks of the branches, and not readily noticed, owing to the non-production of coloured ray florets. This composite (the most interesting botanical specimen collected) has not previously been recorded south of Manly, but there are specimens in the National Herbarium collected at Kurnell by Mr. J. L. Boorman, which, together with an example from Tintenbar (Richmond River) constitutes the whole of the Herbarium material. At the Easter excursion (Tuggerah Lakes) last year, the most important find was also a straggling beach-swamp Composite (*Eclypta platyglossa.* A somewhat unusual form of the well-named (polymorphous) *Plantago varia,* with succulent leaves (due to its saline environment) was found in the crevices of the rocks, and on the beach-strand the compact, herbaceous, *Senecio spathulatus,* whose leaves have become veritable reservoirs for the storage of fresh water. *Bramia indica,* a creeper with white flowers, grows in the moist sand of the lagoons, intermixed with its blue-flowered relative, *Mimulus repens,* "the Creeping Monkey Flower." On the sand-dune two weedy members of the same family (Scrophularineae), introduced from Europe, were seen, *Verbascum blattaria,* "Mullein," and *V. thapsus,* the latter with heavy woolly leaves, which are responsible for its vernacular name, "Beggars' Blankets." The "Russian Thistle," *Salsola kali,* with prickly stems and star-like flowers, which are embedded in the succulent branches, was plentiful on the inner beaches, and numerous tussocks of *Cenchrus australis,* "Burr Grass," lined the sloping banks of one of the arms of Port Hacking.

A. A. HAMILTON.

SOME USEFUL PLANTS.

By E. Cheel.

(*Eleusine coracana.*)

Some few months ago I received from Mr. B. Harrison, of Burringbar, some seed labelled "Wimbi," the native food of the Lumbras and Nandys, British East Africa. The seed is round, and somewhat resembles mustard-seed, except that it is of a brownish colour, and minutely rough. As I was unable to trace the name "Wimbi," I sowed a few seed in November last, and was greatly surprised to find that it belonged to the grass family, and as one of the plants has now flowered, I have been able to determine it, and find that it belongs to the genus *Eleusine,* and is known in botanical literature under the name *Eleusine coracana.*

It transpires that this species of grass is a very important food-plant in India, and according to J. C. Lisboa, is known under several vernacular names, including "Natchni," "Nagli," "Raggi," "Mandha," "Mandhua," "Maruya," "Marua," "Modua," "Mandol," "Cholodra," "Hoda," and "Kurakan." He further states that it is extensively cultivated in the plains and lower districts more than 20 miles inland in India. It is transplanted and weeded like rice. It may be grown almost over stones and gravel; but when sown over a rich soil, the return is enormous in proportion to the area. It yields from five to six maunds (a weight of about 80 lbs., in the East Indies) of seed per acre upon the hills, and 12 to 14 maunds in the plains. In Roxburgh's Flora Indica, Vol. i., p. 343 (1832), a species is recorded under the name *Eleusine stricta,* which is regarded by more modern botanists as a luxuriant variety of *E. coracana.* For this latter form Roxburgh gives "an increase equal to 120 fold, and for another, 500; whilst on two tufts, the produce of one seed, grew 50 stems, and no less than 8,100 fold seeds were carefully calculated to be the produce of this plant. Generally this grain is sold at the rate of 80 to 130 lbs. a rupee.

It is considered by natives to be the most nourishing and invigorating of cheap food. On analysis, Natchnee grain has been found to contain on an average 6.53 per cent. of nitrogenous matter. In this respect, "Natchnee" stands last among the cereals of India. Dr. Forbes Watson thinks that want of nitrogen is more than compensated by the mineral constituents of "Raggi" (Natchnee). It is rich in iron, required for the blood corpuscles, and in potash, lime, and phosphoric acid, essential to various tissues of the body. On the whole, "Natchnee" stands high in food value. The proportion of phosphoric acid in the grain is about 0.4 per cent. In addition to the above statement, J. C. Lisboa reports that "it is extensively used by the poorer classes in several districts of N. India, and in Mysore, and other parts of S. India it is the staple food; sometimes stored in pits, where it keeps without being deteriorated for years." "Natchnee" is eaten in the form of cakes made of the flour, mixed with a sufficient quantity of water and sugar, and baked.

The flour is also used by being stirred with water, then boiled and formed into a sort of thick porridge, named "ambil," in Goa and in South India. Well-to-do people make a sort of pudding, which they call "tisana." It is said that in Darjiling a fermented liquor is prepared from the "Natchnee" grain. The stalks are given to cattle as fodder, or used as fuel.

With regard to *Eleusine stricta,* which is regarded by Roxburgh as a distinct species from *E. coracana,* he states that it is still more cultivated than the latter, and differs from it only in having the spikes straight, being generally of a larger size, and more productive. The great weight of seed, when full-grown, bends the spikes down into a horizontal direction. Roxburgh mentions three sorts of *E. stricta,* and states, in connection with one of these, that "there came up accidentally amongst some rubbish in his garden at Samalcotah, two tufts of this plant. each. upon examination. he found to be the produce of one seed; each had twenty-five stems; and each of these stems had on an average two lateral branches, making in all seventy-five stems and branches; each produced upon an average six spikes (for they had from four to eight), in all four hundred and fifty spikes; each of these had at a medium sixty spikelets. and each spikelet ripened on an average three or four seeds; total produce, eighty-one thousand!"

Much more information could be given from Watt's "Dictionary of the Economic Products of India," and other important works; but the above is, I think, sufficient to show that the plant is well worth a trial in our coastal districts, especially in the northern parts of the State, and particularly in rich flats that are fairly moist, as it appears to grow best in moist situations. Two very closely allied species, namely, Crows-foot Grass (*Eleusine indica*) and Button Grass (*Dactyloteníum aegyptiacum*) are fairly common in many parts of the Commonwealth; but so far as I know, "Natchnee" or so-called "Wimbi" has not previously been recorded, either as a naturalised or cultivated plant, in Australia. Professor Hackel suggests that the "Natchnee" or "Korakan" is probably derived from *Eleusine indica,* whose oblong seeds are marked with more distinct comb-like lines. and whose spikes are more slender. He also states that it is cultivated in E. India, Simla Islands, S. China, Japan, and especially through the whole of Africa. In many parts of Africa it forms the principal food, in spite of the bitter taste of the flour. A kind of bread or unleavened cake is made from it. In Abyssinia and Niam a tolerably good beer is brewed from it. In India it is much prized, as it yields good harvests from very poor soil. My plants at Ashfield are fairly vigorous, and others at Hill Top are making fair progress; from these I hope to secure sufficient seed to carry on the work of thoroughly acclimatising this useful fodder grass in Australia.

Since the above was written, I find that it is mentioned in "Mueller's Select Extra Tropical Plants," which states that the grass is worthy of cultivation on account of its height and nutritiveness, and that according to McKeown, it has been grown in Northern New South

Wales, where it made rapid growth and promised to become a valuable fodder plant. He further states that "horses prefer the hay to any other fodder plant grown in India."

"GINGELLY" (*Sesamum indicum*).—Seeds of this species were exhibited, gathered from plants grown at Ashfield. The plant is regarded doubtfully as a native of India, and belongs to the family Pedaliaceæ. There are several races or forms of the species, differing chiefly in the colour of the seed and different habit of branching. Some of the best of the forms are cultivated fairly extensively in India and Africa, for the seed, which yields oil of commercial importance.

The oil is used in the process of dyeing silk a pale orange colour, and also for making soap, lamp oil, and as a substitute for olive oil; the oil-cake is used as cattle-food.

"DIL" (*Peucedanum graveolens*).—Seed of this species were also exhibited, gathered from plants grown at Ashfield. The original seed was gathered from a crop grown in Kent, England, during a visit to England in 1905; and a few plants had been kept growing ever since. The plant is glabrous and herbaceous, somewhat closely resembling "Fennel" (*Foeniculum vulgare*), and like that plant, is frequently cultivated and used as a vegetable, and for its carminative seed, which is used both for culinary and medicinal purposes. By distillation, from three to four per cent. of oil is obtained from the fruit, which is used medicinally, and in mixtures for perfumery.

MISCELLANEOUS BOTANICAL NOTES.

By A. A. Hamilton.

SCAEVOLA SUAVEOLENS, R.Br.—A plant which grows on the dune-sand at Lady Robinson's and other coastal beaches, part of whose role in the realm of Nature is to assist in the work of resisting the encroachment of the drift sand by spreading itself carpet-like over a large surface. The conditions as to water supply obtaining on the beach are not favourable to vegetation, so this, and other carpet-forming plants, notably, the "Pig's Face," with its exceptionally long botanical name, *Mesembryanthe-*

mum aequilaterale, Haw. (which refers us to the fact that its flowers open best on a sunny day), have grown succulent leaves, stems, and even fruits, containing cells which act as reservoirs for storing water. This provision has been made to enable the plants to maintain their equipoise, and neutralise the effects of a hot wind, or other drying factor, which would deplete them of moisture more rapidly than they could assimilate it, as the strand water contains a large percentage of sodium chloride, which is taken up in solution by the ascending liquid, and if absorbed in too great a quantity, acts injuriously on the health of the plant, which, as a consequence, must imbibe its liquor discreetly. When grown in a loose permeable soil, at a distance from the beach, and treated to a liberal ration of manure, it produces a profusion of handsome flower spikes. which stand up well above the foliage, and are reminiscent both in the arrangement and the delicate hue of its flowers of the introduced ornamental aquatic plant, which has become a pest on the Northern Rivers, the "Water Hyacinth," *Eichornia speciosa,* Kunth. The flowers are followed in due season by shining-coated, succulent, purple berries, very little inferior for ornamental purposes to the flowers. The name of this plant is not particularly well chosen, as *Scaeva* means the left hand, to which an obscure resemblance is found in the corolla. *Suaveolens* (sweet-scented) is an improvement, though the perfume is almost overpowered by the marine odour prevalent on the beach. Seeds germinate readily, and the resultant plants are amenable to ordinary garden treatment.

OLEARIA MYRSINOIDES, Fr. W., "A Musk Aster."—Our Australian vegetation is exceptionally liable to variation, owing largely to the numerous and frequently sudden changes in the environmental conditions encountered within a limited area. In some instances there is also an inherent tendency to diverge from the typical form, and build up new varieties and species, though the plants may be growing in company, under apparently similar environmental conditions. The most notable offenders in respect of these spontaneous alterations of structure are to be found, as the name indicates, in the Family Proteaceae. When growing in its usual habitat on the impoverished Hawkesbury sandstone, our "Aster" is a straggling shrub of 1 to 1½ feet, with small sclerophyllous leaves, which have on their under-surface closely appressed hairs attached by the centre; those of the young leaves reddish, changing in the older ones to a dark brown. These characters, the coarse leathery epidermis of the small wrinkled leaves, and stunted growth of the plant, together with its shabby, faded vestiture, are palpable evidence to the most superficial observer of a desperate struggle for existence under adverse circumstances. In a moist gully at Mount Victoria, under the shadow of Mount Piddington, growing among the accumulated debris of leaf-mould and decaying vegetable matter, a rich deposit washed down by the mountain stream, several plants of this species were noted, whose general appearance was so different to that of the normal shrubs, that it was not until they had passed a searching examination, with the aid of a descriptive work and a powerful lens, that they were satisfactorily established as luxuriant members of the same species, for the plants reached 4ft. in height, and had comparatively large, broad, soft leaves, with a vestiture of shimmering silvery hairs, whose "Pile" the silk velvet manufacturer might seek in vain to imitate. There is strong presumptive evidence that it would not require a lengthy sojourn in such an environment for these characters to become so fixed as to eventually evolve a distinct species. The Tasmanian representative of our plant, as figured in Labillardiere's Plantæ Novæ Hollandiæ, is smaller and more rugged than our Blue Mountain form, a condition for which the rigorous climate is no doubt responsible. It was noted that in the smaller (Tasmanian) specimens the leaves had no stalks (sessile), in the rough mountain form the leaf-stalks (petioles) were barely one line long, while in the large form the leaves are pendant on stalks half an inch long.

CASSINIAS FROM COOK'S RIVER.

By A. A. Hamilton.

Almost within the proverbial stone's throw of each other, in the neighbourhood of Cook's River, a locality richly endowed botanically, no less than four *Cassinias* may still be collected, viz., *C. longifolia*, *C. aurea*, *C. aculeata*, and *C. quinquefaria*, for the authorship of which quartette Robert Brown is responsible. Of these, three have flowers of a more or less chalky-white, while the fourth (*C. aurea*), the "Golden Cassinia," has flowers of that shade of yellow found in our Australian gold coinage. In three of the species the arrangement of the inflorescence is corymbose; the flowers of the fourth (*C. quinquefaria*) being grouped in a pyramid. It is, in some cases, difficult to differentiate between the small-flowered *Helichrysums* and the *Cassinias;* the most reliable character will probably be found in the presence of scarious bracts between the flowers in *Cassinias,* which are not present in *Helichrysums. C. longifolia* comes from the south, and exhibits a preference for shady positions, a remark which also applies to *C. aurea,* both species having the comparatively large flattened leaves of plants not usually subject to extremely adverse conditions. Bentham, Fl. Austr. (3-586) questions the validity of raising *C. aurea* to the dignity of a species, considering it to be merely entitled to rank as a var. of *C. longifolia. C. aculeata,* whose narrow cylindrical crowded leaves denote the xerophyte, makes a choice of harsh dry conditions, in which to consummate its life-history, and in this it is imitated in a lesser degree by its confrere *C. quinquefaria.* The latter is firmly established in both the western and northern parts of the State, and is probably an alien in the Port Jackson district, as it has only been collected in one locality in that area other than Cook's River, viz., Kogarah. *C. aurea* appears to be the only member of this group which has been accorded the privilege of making a floral display in Britain, an excellent coloured plate of a plant of that species, grown in an English nursery, being honoured with a place in Edward's Bot., Reg. t. 764. With the exception of *C. aurea,* the specis noted are gregarious, the latter alone displaying an individualistic tendency.

NOTES AND COMMENTS.

The following interesting notes on plants collected by him during a recent trip to the Northern Rivers are contributed by Mr. Cheel:—

Callistemon viminalis.—This is very common all along the river embankments of the Upper Clarence, right up to Copmanhurst, as well as the Orara River.

Dendrobium Kingianum.—Some sandstone rocks along the Orara River were covered with this species, which, with its purplish-coloured flowers, was a very pretty sight.

Hydrocharis morsus-ranae, Potamogeton crispus, Triglochin, sp.—These three species of aquatic plants were very plentiful in the upper parts of the Orara River.

Agonis scortechiniana, Melichrus adpressa, Leptospermum Liversidgei.—These three species of interesting plants were very plentiful at Broadwater, on the Richmond River.

Elaeocarpus obovatus, Gastrodia sesamoides (an orchid), and Macadamia ternifolia (Popple Nut), or so-called Queensland Nut, as well as Hicksbeachia pinnatifolia, were the most interesting plants seen at Murwillumbah. The "Hicksbeach or Red Bush Nut" was in fruit, and as the exocarp is of a very bright reddish colour, it is very attractive. It is not generally known that the kernel of this nut is very sweet and quite as good to eat as the "Popple Nut." As the shell is much thinner than the latter, it is not nearly so hard to crack, a fact which should tend to encourage the cultivation of this excellent nut for commercial purposes.

Emilia sonchifolia and Oenothera longiflora.—These two species are exotics, and have become naturalised at Tweed Heads. They have not previously been recorded for New South Wales.

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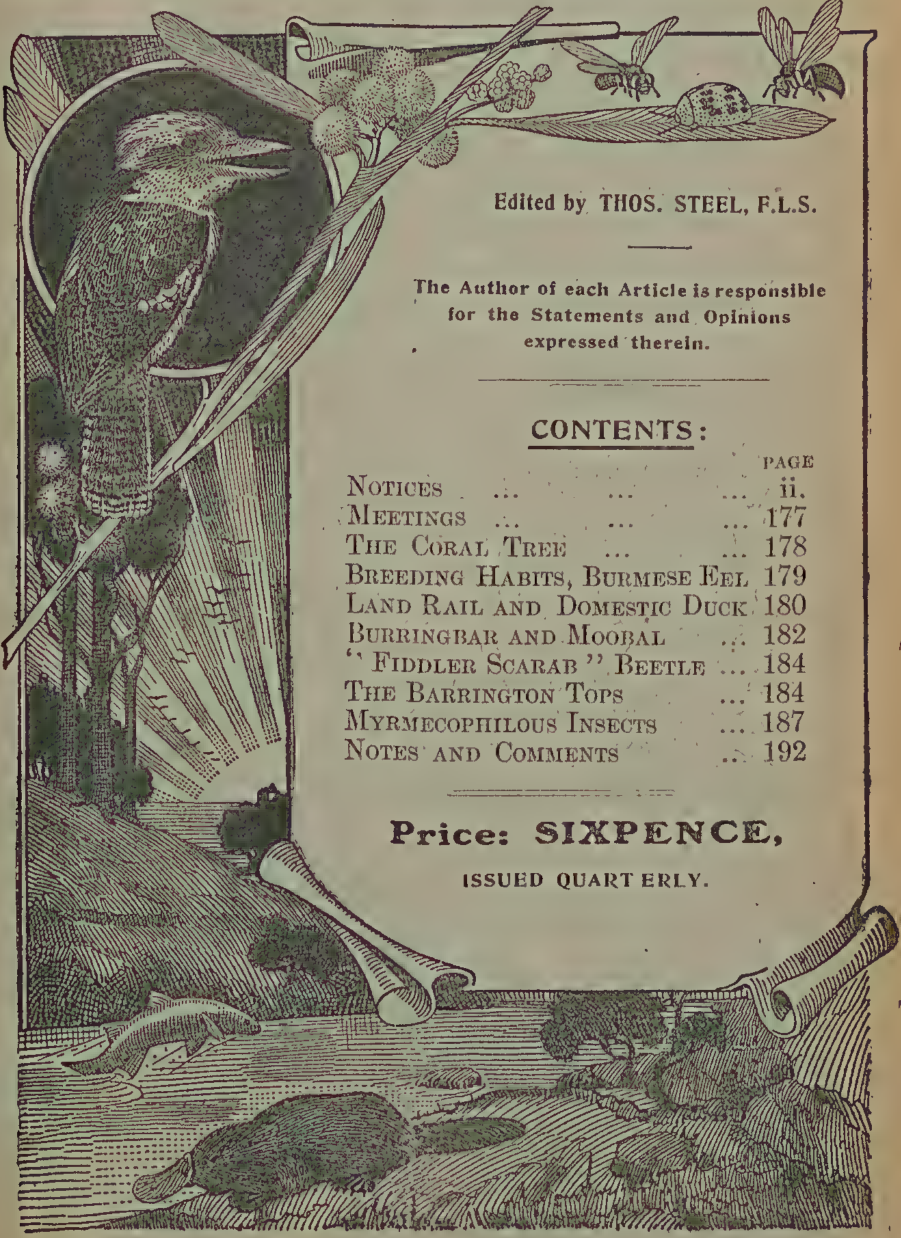
JOURNAL AND MAGAZINE OF THE NATURALISTS' SOCIETY OF NEW SOUTH WALES



Edited by THOS. STEEL, F.L.S.

The Author of each Article is responsible for the Statements and Opinions expressed therein.

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NOTICES.

MEETINGS—*April 3.*—"Birds of the Riverina," Mr. Froggatt.
May 1.—"Astronomy," Mr. Gale.
June 5.—"Rambles in Tasmania," Mr. Tillyard.

EXCURSIONS.

April—Easter Excursion.
May—"Geology," Mr. E. S. Edwards, M.A.
June—Zoological Gardens, Taronga Park.

NATIONAL HERBARIUM MELBOURNE VICTORIA

THE
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VOL. III. APRIL 3, 1917. PART 14.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

6th February, 1917.—The usual monthly meeting was held in the Education Building, Mr. A. A. Hamilton (President) in the chair, and about 60 members present.

A letter was read from Mr. C. H. Wickham, Hon. Librarian, resigning his position owing to change of residence. Mr. Cheel moved that a letter, expressing the regret of the members at losing so valued and popular an official, be sent to Mr. Wickham. This was seconded by Mr. Finckh, and spoken to by several members, and carried unanimously.

Miss Bessie Somerville and Mr. R. V. Matthews were duly elected members.

A paper by Mr. E. E. Larcombe, Trangie, entitled, "Life History of *Apina callisto* (Liparidæ)," was read by Mr. Froggatt, on behalf of the author. Mr. H. E. Finckh contributed an excellent paper on "Breeding Habits of the Burmese Eel (*Amphipurus cuchia*)." Mr. Stead congratulated the author on his observations, and remarked that so far as he was aware, this was the first record of the breeding of this fish in Australia.

Mr. W. H. Dudley le Soüef gave what proved an extremely interesting lecture, "The Nesting Habits of Australian Birds." The lecture was delivered extempore in Mr. le Soüf's happy chatty manner, and was illustrated by a very fine series of lantern slides taken by the lecturer. Many of these, particularly the opening slide showing gum-trees growing in a flooded swamp, were technically perfect examples of slide production, and were extremely beautiful. Mr. le Soüef imparted a great deal of valuable information in a manner well adapted to impress it on the memory, and at the close of his lecture was awarded an enthusiastic vote of thanks.

6th March, 1917.—The usual monthly meeting was held in the Education Building, Mr. A. A. Hamilton (President) in the chair, and 40 members present. Mr. S. J. Dodds was duly elected a member.

Miss Agnes Brewster read a most useful paper on the "Pollen Grains of the Myrtaceae, Proteaceae, and Epacrideae," illustrating her remarks with drawings. Also on behalf of Miss Mabel Brewster, a "Life History of a Cricket." Miss Clark exhibited larvae of the Green Wanderer Hawk Moth. Miss Froggatt contributed an interesting paper on "Moth Cocoons." Mr. McCarthy, a paper on "The Nest-making Habits of the Tread-waisted Sand-digger wasp, *Ammophila suspiciosa.*" Mr. E. H. Zeck, on "Myrmecophilous Insects." Miss Shiress exhibited a Waratah grown from a bush cutting.

Mr. McDonald proposed a special vote of thanks to the members who had contributed papers for the evening, and emphasised the fact that "Members' Nights" were proving a great attraction. This was carried unanimously.

THE CORAL TREE AND ITS METHOD OF ADAPTATION TO OUR CLIMATE.

By Miss Agnes A. Brewster.

An interesting example of adaptation to climate is seen in the Coral Tree (*Erythrina indica*). It lives in a hot climate—indeed, it has migrated from Queensland—and yet it has deciduous leaves, which is rather unusual in trees of very hot lands. During the leafless period it is enabled to partly supply the loss of food manufactured by the leaves, by means of a layer of very green cortex just beneath the thin smooth bark. This food is stored in the medullary rays and in the pith, chiefly in the form of starch. If a thin cross section of a young stem be cut, and mounted in a very weak solution of iodine, the medullary rays and the cells of the pith are outlined most clearly by the response of the abundant starch grains to the iodine as they turn blue. The storage of starch in such quantities is probably for the purpose of having a ready supply of food for the development of the flowers, which appear before the leaves, and later on, for the development of the leaves themselves, as well as to keep up the stock of food usually stored in small quantities in most stems.

The pith is very curious in structure, for instead of being solid it is in the form of small rounded plates, with spaces between filled with a watery fluid. This storage of water may have some connection with the character of the leaves, which are mesophytic (neither water-loving nor heat-loving), for they are large, wide, and thin, though they have a fairly thick epidermis and fairly numerous stomates on the under-side. Then, when the leaves do appear, they are used to a high degree to manufacture food, and if that is so, then transpiration or the giving off of water vapour will be fairly great also. Part of this stored water may be used to supply the leaves with moisture to counterbalance the greater transpiration of this heat-loving plant, to prevent the fatal loss of too much water in the hot summer months.

On the older stems there are large stout thorns, which have also a green cortex layer and thin bark, but produced into a very sharp hard point at the apex. These protect the plant by presenting hard pointed surfaces. A valuable note is made by Dr. Farmer in the "History of Plants." where he states that in the case of those plants which store more water than the usual supply, this water is necessary to keep the protoplasm of the cells concerned in a healthy condition to enable it to use this stored food. If water be wanting—and this is very likely in a climate such as ours—the stored food cannot be made use of, and the protoplasm will die.

BREEDING HABITS OF BURMESE EEL (*AMPHIPURUS EUCHIA*).

By H. E. Finckh.

This eel, which is brought at times to us from China, is well known to many of us, and for eight years I have had three of them in a rather large tank. On the 7th January this year I noticed that some eggs had just been laid, giving me the opportunity of studying the behaviour of the adult fish towards the eggs.

Many of you know how the Paradise Fish (*Macropodes*) breeds, and have watched the construction of the nest and the method of depositing the eggs. The fish make a nest of air-bells by inhaling air from the surface, holding it in the mouth for a short time, and then letting it escape mixed with saliva. A mass of coherent air-bells, two to three inches in circumference, is thus formed. and the eggs which have been laid are gathered by the male fish in his mouth and placed amongst the air bubbles. He watches over the eggs until hatched, and the young until old enough to take care of themselves.

The Burmese eel acts in a very similar manner. Always the one eel gathers the eggs and places them in the air-bubble nest, watching them unremittingly until hatched. The eggs are fairly heavy and readily sink from the nest when the tank is tapped or the water disturbed; but the fish replaces them immediately. I have seen the eel gather as many as eight eggs in his mouth at once and then put them back in the nest. He pokes his head right through the nest and endeavours to place the eggs on top of the mass of bubbles.

In about eight days the young are plainly visible, wriggling about in the egg. The eggs, being on top of the nest, and in some cases quite half an inch above water-level, are fairly dry, and the embryo eels become very active when the eggs are moistened by sprinkling with water.

The eggs hatch in twelve days, and the young remain in the nest for quite a week. A couple of weeks after the eggs were laid I found one of the adults dead at the bottom of the tank. Perhaps it had been trying to get at the young and had paid the penalty.

LAND RAIL AND DOMESTIC DUCK.

By Harry Burrell.

Early in September, 1908, I induced a Land Rail (*Hypotaenidia philippinensis*) to build her nest in a hollow log arranged on a box two feet from the ground. My object in raising the spout was to prevent a pinioned Black Duck (*Anas superciliosa*) from interfering with the nest. Everything went on as I desired until the little rail began to show signs of broodiness, which she did by fanning her wings and trailing them along the ground like an old Turkey-gobbler. This action of conceit seemed to excite the jealousy of the duck, for she spent most of her time either scolding the rail or practising a fluttering high jump, to secure possession of the hollow spout—a feat which she accomplished with less exertion after the initial entry. Each time she entered the nest, she cautiously chipped an egg, so that she could carry it away conveniently between the tips of her bill to a pond, where an egg flip was systematically puddled to her liking. A day or two after destroying the eggs she rearranged the nesting material and lined it with down, and then laid the maximum clutch of fifteen eggs. During this time the rail kept sentry on top of the log, and popped into the spout to sit on the eggs during the interval each time the duck jumped off for her food. This double shift continued until November 8th, when six young ducklings were hatched out.

On the following day they jumped out of the spout and made off in haste to the pond, and as it was impossible for them to return again to the nest, the mother was compelled to desert the remaining eggs, and tend to the wants of her brood. Thereafter, the rail regained permanent possession of her hard-fought-for log. It was just possible for her to cover one duck egg at a time, and for three days she manoeuvred alternately from egg to egg, and succeeded in bringing forth four healthy young ducklings. I examined the five remaining eggs and found them to be infertile. I placed the young ducks in the pond with the six previously hatched, with which they became quite friendly, and paddled about together, and left them contented, thinking that all trouble was now at an end. But when I returned later in the day I found three lifeless bodies of the later brood floating on the water, and was only just in time to save the fourth. The mother duck was deliberately holding it in her bill and plunging it under the water, evidently with the intention of drowning it, and probably the other three had been treated in a like manner. However, I rescued the little out-cast, and when it had sufficiently revived, placed it on a miniature raft of straw and soft grasses, and set it adrift in a tank. There it thrived for two weeks on soaked bread and mosquito larvæ, for the water was simply teeming with the latter, which in this instance proved to be the staple food. I brought the duckling indoors at night, and made it cosy in a small box, with suitable warm bedding. But one morning, after a severe storm, I found the supply of wrigglers had been completely washed away, and two days later, November 23rd, the duckling died.

BURRINGBAR AND MOOBALL DISTRICTS, TWEED RIVER, OCTOBER, 1916.

By Miss F. M. Irby.

The Blue Fig-trees, *Elaeocarpus grandis*, are covered with handsome fruit; they look good to eat, and school children seem fond of them; but only a thin layer of pulp surrounds the hard ornamental stone, and that little is extremely acid.

The Queensland Nut, *Macadamia ternifolia*, is also flowering, and many of the bushes are already covered with long strings of green fruit. The Red Nut is also flowering. All who know them prefer this nut of the two, and the shrub is so handsome (not unlike the tamarind, *Diploglottis cunninghamii*) that it would be well worth cultivation in any garden for the foliage alone.

The smaller wild flowers are extremely scarce. One little white daisy was plentiful, growing on a bushy plant from one to two feet high. The wild purple convolvulous and *Bignonia jasminoides* were plentiful, so was *Mucuna gigantea*, with its striking green flowers. This creeper is easily grown from seed, is both peculiar and handsome in appearance, yet I have never seen it in any garden.

One handsome tree flowering now has creamy heads of feathery stamens, another is covered with strings of tiny coloured flowers, borne in such profusion that the large trees look quite yellow. The pink and wine-coloured flowers of the green kurrajong are everywhere, and another, *Hibiscus*, with a very similar flower, but with a large hairy leaf, is very plentiful. The maiden's blush trees are a beautiful sight, with their white-crowned heads; they always remind me of a *Dombeya* tree, but on a much larger and handsomer scale.

Bird life is by no means plentiful in such parts of the Tweed as I have visited; Dollar birds, Macleay Kingfishers, and the big red and blue Pennants Paroquet seemed most numerous. A curious brown water snake is plentiful in the big swamp drains. In the swamps grow great quantities of the beautiful climbing maiden-hair.

In the more dense scrubs it is almost impossible to obtain specimens owing to the way in which all vegetation pushes upwards to the light. Fernlike-creepers cover the stems of many of the trees, and the Elkhorns, Staghorns, and Orchids that deck both trunk and branches, looking as though someone, with careless hand, had scattered them there, sticking where they fell, in most haphazard fashion. Where a patch has been burnt, wild passion-vines, with star-like, creamy flowers twine over the decaying remnants of the forest. Near the beach, Mooball Creek is a sight not easily forgotten. All up the wide bed, *Nymphea stellata*, the little blue lily, with a scent like an elusive dream, massed in thousands, until the wide stream is one giant wave of blue.

A very dainty white-flowered creeper is fairly plentiful. It is not unlike a glorified blackberry bush. But in October all else pales beside the native *Wistaria*, growing so rankly, the bunches so huge, often seventeen or eighteen racemes of blossom clustered together in one glorious flower head.

I saw one tiny creek, where the scrub grew wild and rank, the water was shaded by huge vine-covered trees on either side, struggling to reach the light, palms bent across the dark and narrow stream, and draping the undergrowth with a curtain fortunes could not buy, hung the *Wistaria*, a mauve and purple mass. In the distance old Mount Warning loomed, fit background to the scene; and it took some moments to remember it was only our "Grey Australia," for it might have been old Japan.

LIFE HISTORY OF THE "FIDDLER SCARAB" BEETLE (*EUPOECILA AUSTRALASIAE*).

By Miss Mabel N. Brewster.

At Tuggerah Lakes in September, 1916, a cluster of cocoons of the Fiddler beetle were found at the base of a hollow stump of a Eucalyptus. On opening 18 of them one adult was found, which was dead and faded, so was probably a previous season's beetle. In every other cocoon was the curled fat grub, typical of the lamellicorn beetles. The broken cocoons (one end was broken off) were placed in a box, and by November 20th all had pupated except two, and the beetles were out with the exception of one, which was still a pupa. The beetles were placed in methylated spirits (as we had no killing bottle at hand), and two of the apparently dead beetles were placed in a box with the pupa (which had been also placed in methylated spirits). On looking at the box a few days later the beetles were alive and the pupa had been devoured—only a shell left.

THE BARRINGTON TOPS, COPELAND, THE COMBOYNE, AND DORRIGO.

MAITLAND SCIENTIFIC SOCIETY ANNUAL MIDSUMMER EXCURSION

By J. E. Roberts.

We travelled by rail to Gloucester, and visited the old mining township of Copeland during the afternoon. Our geologist here obtained convincing evidence that the district is Devonian. While so engaged we rambled through the surrounding forest. I gathered—at the head of a gully—a specimen of the Osage orange (*Maclura aurantica*), an introduced shrub, to be seen growing in the Botanical Gardens, and wondered why and whence. The wandering white butterfly, *Belenois java,* were sheltering in thousands in the undergrowth, birds were abundant; but nothing rare fell to the net of the entomologists during our short stay. Next morning we left Gloucester by car for Rawdon Vale, on the Barrington. Here the guide met us with horses, and after camping on the foothills for the night, we began the ascent early the following morning. The climb to the Tops, 4,500 feet, took five hours. On the lower slopes we left the white butterflies; these were replaced by the browns, *Junonia villida, Pyrameis kershawi,* and *Heteronympha merape.* Bordering on 3,000 feet we entered a forest of beech, *Fagus Moorei,* the bushman's mock cedar. The trees were magnificent specimens, growing in rich volcanic soil, and the journey through the shady coolness is something for the westerner to dream of while the thermometer is working overtime. The boles of the trees were in many cases covered with a filmy fern, *Hymenophyllum tunbridgense,* which gave them a sickly appearance.

Butterflies were left behind, and when we emerged upon the plateau I saw only a few small browns, one specimen of Macleay's swallow-tail, and several *Belenois java.*

The ground is boggy in all depressions and rich in orchids, sundew, wild violet, and *Stylidium.* I was delighted to see the rich colouring of the *Stylidium* and violet. I was not the botanist of the expedition, but gathered specimens of *Diuris* (five varieties not previously seen by me); *Dipodium punctatum, Lotus australis* (suspected of being poisonous); and the common *Pimelia, Dillwynia,* etc., and a small *Hakea.* An interesting small specimen was *Erigeron pappochromus,* found in high altitudes like Kosciusko and Cradle Mountain (Tasmania), but lacking the extreme woolly appearance of the latter specimen, and a small specimen of *Epacris brevifolia,* a plant which has been confused with the Tasmanian *E. heteronema.*

Bird life on the plateau comprised the Welcome Swallow along the creeks, the Spur-winged Plover on the open plains (a real one-tree plain, about three miles by one), and the Black Magpie or Pied Bell Magpie (*Strepera graculina*), with its strong and jolly call, and one Flame-breasted Robin. Lyre Birds, Thrushes, and Tree Creepers were plentiful in the brush and undergrowth on the upward climb.

Upon our return we took train to Wingham, and thence by car 27 miles to the Comboyne, a tableland between the Hastings and Manning Rivers. The climb up the mountain to 2,300 feet from sea-level is productive of very fine scenery. The outlook toward the sea is much more extensive than you get from, say, Bulli Pass. Here are delightful little corners on the winding road, and the flowering cork and kurrajong give a pleasant variety of colour among the masses of vines and foliage.

The brush on the Comboyne is rich in these well-known timbers, for which the North is famous, and it was something of a novelty to sleep and eat in a weatherboard cottage of rosewood, lined throughout with the same valuable timber.

There is a fine outlook from Comboyne towards the East, where ships fifteen miles away are clearly seen, and the waters of the lake glisten in the morning sun. Cascades and waterfalls are almost as common as country culverts, and as the rainfall is good, they are always worth seeing.

Fifty species of birds were noted on the journey. Pigeons (five species), the Swamp Pheasant (a handsome cuckoo, which builds its own nest), the Rifle Bird, the Regent Bower Bird, and a Wren with a chestnut back, were all new to me.

Beetles in profusion cross one's path. I collected *Anoplognathus chloropyra, Diaphonia dorsalis, Eupoecila australasiae, Diphucephala.*

Macleay's Swallow-tail Butterfly was very plentiful, and Robber Flies in abundance. I collected three species, the giant *Blepharotes splendidissima, Asilis grandis,* and a *Laphria.*

We saw the giant feasting on a spider, and another flying away with a fine *Anoplognathus.* I tried to capture this fellow while riding, but the novel conditions were too much for me and the horse, and he escaped by flying to the top of a 50 ft. tree with his load. Solitary wasps (*Eumenidae*) were plentiful, sheltering among the shrubs; but the hasty nature of our sight-seeing was not favourable to the entomologist.

The small beetle, *Diphucephala,* was collected on Barrington Tops. There were evidently millions of them on all the small flowers, like the orchids on the swampy ground.

MYRMECOPHILOUS INSECTS.

By E. H. Zeck.

When reading through a list of insects recorded from ants' nests in New South Wales, one is surprised at the number of families represented, and the numerous species that have been found in these situations. Below will be found notes on species taken in the neighbourhood of Sydney. Before giving them, it may be of help to those who perhaps have not previously collected ants' nest insects to give a few hints on their collection and preservation. The only nests examined by me so far have been those situated under stones or bark. Probably many good specimens may be obtained from nests in the open.

Usually, when first collecting, many species of beetles are passed over, owing to their protective colouration and their remaining quiet for several minutes before moving, the members of the *Genus Chlamydopsis* being perhaps the most difficult to detect—in fact, they may even be turned over among the debris without showing a sign of life. The legs, antennae, and head are all withdrawn into cavities in the body.

Small mites are frequently mistaken for *Rodwayia* (a minute oval beetle), but one can easily tell the difference in the nest, even without a lens, by their different mode of walking.

After examining a nest the stone should always be replaced, so as to permit of re-examination at some future time.

The insects when caught are best placed in small tubes of methylated spirit, along with some of the ants in whose nest they were found. A dry grass stem, dipped in spirit, is excellent for picking them up. Later they are gummed on small cards, with the legs and antennae carefully spread out, and one or more of the ants should be placed on the same card, through which a pin is run. A small locality and date label is placed below the card. The gum must be used very sparingly.

The following are notes on species taken in the neighbourhood of Sydney. I am indebted to Messrs. A. M. Lea and W. Du Boulay for the identification of these beetles, and to Mr. T. McCarthy for the identification of the ants.

Family CARABIDAE.—Of this family I have taken but two specimens, which were in the nests probably by accident. The ants were *Componotus nigriceps, Iridomyrmex rufoniger.*

Family STAPHYLINIDAE.—*Conosoma sp.,* taken at Como in the nest of *Ectatomma metallicum,* are small shiny beetles, 4 mm. in length, with short elytra and elongated abdomen tapering to a point. They are extremely active and difficult to capture.

Glyptoma Kingi, Lea.—Is a chestnut-red beetle, 2½ mm. long, taken in numbers in the nests of *Iridomyrmex rufoniger.*

Polylobus semiopacus, Lea.—Taken in the nests of *E. metallicum,* are brownish in colour and 1½ mm. long.

Family PSELAPHIDAE. Batrisodes myrmecophilus, Lea.—Taken in various nests of *Euponera lutea.*

Batrisodes bimucronatus, Raffr. (not previously recorded from ant nests).—Taken at Narara in a nest of small black *Iridomyrmex,* in a tree stump.

Batrisodes, sp.—Taken in the nest of *Euponera lutea* at Canterbury.

Eupines flavoapicalis, Lea.—In nest of *Euponera lutea.*

Tmesiphorus formicinus, Macl.—In nests of *Euponera lutea.*

Plectusodes breviceps, Raffr.—In nests of *Cremastogaster sp.* and *Ectatomma metallicum.*

Plectusodes sp.—In nest of *Euponera lutea.*

Articerus, two sp.—One sp. taken at Como in the nest of *Iridomyrmex rufoniger;* the other in the nest of a small black *Iridomyrmex* at Berowra. This genus is very curious, having the antennae apparently one-jointed. All the *Pselaphidae* mentioned are of a brownish colour, and have short elytra, leaving a number of abdominal segments exposed. None exceed 3 mm. in length.

Family SCYDMAENIDAE. Scydmaenus incerticornis, Lea.—Taken in the nests of *Iridomyrmex rufoniger.*

Scydmaenus sp.—In the nest of a small black *Iridomyrmex.*

Scydmaenilla pusilla, King.—Taken in nest of *Stenamma longiceps.*

Heterognathus carinatus, King.—Taken in the nest of *Irid. rufoniger*.

Heterognathus sp.—From the nest of *Euponera lutea*. These species are all of a yellowish brown colour, and the elytra entirely cover the abdomen. The largest mentioned sp. is only 1½ mm.

Family TRICHOPTERYGIDAE. Rodwayia orientalis, Lea.—Taken in the nest of *Ectatomma metallicum*.

Rodwayia sp.—In the nest of *Polyrhachis ammon*. These are small oval beetles, yellowish in colour, and not more than ¾ mm. in length. They are without eyes.

Family HISTERIDAE. Chlamydopsis agilis, Lea.—This is an extremely rare insect, the specimen which I was fortunate enough to secure being the fourth one recorded. It was not until the nest had been opened several minutes that the beetle was seen crawling slowly out of one of the tunnels. Taken at Hunter's Hill, 28/6/15, in the nest of *Ectatomma metallicum*. This beetle is of a dark brown colour, and about 3 mm. in length. The hind legs are almost twice the length of the body.

Chlamydopsis epipleuralis, Lea.—This is perhaps the most common of all the *Chlamydopsis* about Sydney (though they are all rare), numbers of this species having been taken in a single large nest. Live specimens are easily seen in the nest being reddish-yellow in colour. The ant, *Iridomyrmex gracilis*, is black. Length of beetle, 2¾ mm.

Chlamydopsis serricollis, Lea.—A specimen of this beetle, taken by me at Como during June, was in a little excavation in the floor of the nest, this excavation being the exact size of the beetle and deep enough to allow the elytra to come level with the surface. The beetle was black in colour, but being somewhat covered with dust, would very easily have been passed over had it not been for the minute golden spot on each elytron. Another specimen was taken at Oatley during September. Length, 2½ mm.

(*Chlamydopsis*), *Ectatommiphila opaca*, Lea.—Whilst collecting at Oatley during September, 1916, I observed in the nest of *Ectatomma metallicum* two *Ectatommiphila opaca*, in different parts of the nest. One was of the usual dark brown, almost black colour, with the outer edges of the thorax and appendages reddish. The other was a very light yellowish brown, as though it had only emerged from the pupa some little while before. Length, 2½ mm. In one large nest of *E. metallicum,* beneath a stone, I captured *Ectatommiphila opaca,* and remaining to further examine the nest, I saw *Chlamydopsis serricollis* crawling slowly out of one of the tunnels. This was the first and only occasion on which I have seen two different species of *Histeridae* in the same nest.

Family COLYDIIDAE. Nepharis costata, King.—Was taken in numbers in the nests of *Iridomyrmex rufoniger.* Length, 3 mm.

Kershawia rugiceps, Lea.—Taken in the nests of *Iridomyrmex rufoniger,* is a dull brown beetle, about 4 mm. in length. Several specimens of this sp. were taken at St. Marys, in a nest of the same sp. of ant.

Family BRENTHIDAE. Cordus hospes, Germ.—I have taken in the nests of the following sp. of ants:—*Iridomyrmex gracilis, I. rufoniger, I. sp., Camponotus nigriceps, C. claripes.* The largest specimen of this shiny brown weevil measured 9½ mm., the smallest 6 mm.

Cordus sp.—Four specimens of this beetle were taken in the nest of *Camponotus claripes* at Como. They were very variable in size, the largest measuring 12 mm., the smallest 6 mm.

Besides *Coleoptera* (Beetles), other orders of insects are found with the ants.

The *Collembola* (Springtails).—Are very numerous in nests that are in damp situations.

Thysanura (Silverfish).—Are represented by a small yellowish species that is very agile.

Orthoptera.—The only species noticed was a small wingless cricket, which is quite numerous at times.

Hymenoptera (Wasps).—Three wingless species have been taken, two were found in the nests of *Euponera lutea.* The other was in the nest of a small brown ant, probably an *Iridomyrmex.*

Hemiptera (Bugs).—One species, probably a *Reduvid*, was taken in the nest of *Euponera lutea*. A small light brown bug is quite numerous with the same species of ant.

Coccidae.—One species of scale insect was taken in the nest of a small brown ant at Oatley. The same scale I have since taken at Como, in the nest of *Euponera lutea*. In both cases they were attached to roots within the nest.

Diptera (Flies). *Family SYRPHIDAE* (Hover Flies). —In a nest of *Iridomyrmex gracilis* at Como, during July, a small cluster of pale yellowish cocoon-like objects (which were really pupae), eight in number, were seen by me. They were parchment-like in texture. Each was flattened at the base, with the upper surface rounded, and when viewed from above, oval in outline, the measurements being—length 8 mm., width 4 mm., height 4 mm. Running longitudinally on the dorsal surface are two rows of small protuberances, and around the sides near the basal margin there is a single row. In the centre of the posterior (tail) end there is an elongated process, and at the anterior (head) end there are two thinner processes. Unfortunately only one specimen hatched out in the jar with perfect wings, about three weeks later; of the remaining specimens, six did not develop wings, and one did not hatch out.

The perfect fly is black, with metallic blue tints. The femur and tibia of the legs are orange coloured. The antennae stand out distinctly in front of the head. The wings are transparent, but the veins towards the tip have smoky-brown borders. Length from head to tip of wings, 10 mm.

The empty shells of these pupae I have seen in ants' nests in the hollow branches of *Acacia longifolia*, at Cook's River.

Many interesting notes and descriptions of myrmecophilous beetles will be found in the following papers:—

Proceedings Roy. Soc., Victoria, Vol. XVII. (New Series), pt. II., 1904; Vol. XXIII. (New Series), pt. I., 1910; Vol. XXIV. (New Series), pt. I., 1911; Vol. XXV. (New Series), pt. I., 1912; Vol. XXVI. (New Series), pt. II., 1914; Victorian Naturalist, Vol. XXVII., No. 3, 1910.

NOTES AND COMMENTS.

University Extension Board.—We note with pleasure that our colleague, Mr. E. S. Edwards, M.A., has again been appointed a member of University Extension Board, a position which he has occupied since its inception.

Our Officials.—To fill the vacancy caused by the regretted resignation of Mr. C. H. Wickham, owing to change of residence, Mr. W. B. Gurney has been appointed Hon. Librarian, and Mr. F. W. Carpenter has taken Mr. Wickham's place on the Outing Committee.

Myrmecophilous Insects.—Mr. Zeck's paper in present issue is a valuable contribution to a most interesting subject. Many of us, however, wonder how Mr. Zeck deals with the nests of large and lively ants. How he manages to collect the insects described, with the ants running about angry and disturbed. Perhaps Mr. Zeck would oblige with a note, giving details of the mode of digging up the nests and collecting the insects.—Ed. *A.N.*

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

3rd April, 1917.—The President, Mr. A. A. Hamilton, in the chair, and 45 present.

The following were elected members:—Misses Sheehy, Brenda King, and Hilda McCredie, and Mr. W. Stewart.

Mr. H. E. Finckh exhibited a freshwater fish, *Xiphophones Helleri,* from southern U.S.A. and Mexico.

Miss Busby gave an interesting account of her recent visit to Mrs. Roberts' private zoo at Hobart.

Mr. Froggatt delivered a fine address on "The Birds of Riverina," illustrated by excellent slides of bird and camp life taken by himself.

1st May, 1917.—The President, Mr. A. A. Hamilton, in the chair, and 40 members present.

The following were duly elected members:—Miss Bray and Mr. and Mrs. E. Bryce.

Mr. H. E. Finckh contributed "Notes on the Bitterling" (*Rhodeus amarus*).

Mr. W. F. Gale delivered a most instructive lecture on "The Sun and Some of Its Phenomena," illustrating his remarks by some fine photographs taken at Yerkes and Mount Wilson observatories.

5th June, 1917.—Mr. A. A. Hamilton, (President) in the chair, and 52 present.

Master P. D. F. Murray was duly elected a member.

Mr. R. J. Tillyard delivered a descriptive lecture on "Cradle Mountain, Tasmania, and its Natural History," outlining the geological features of the district, and illustrating the alpine character of the peaks and lakes by means of beautiful photographs. After describing the famous "Pines" of the mountains, he gave details of his finds, particularly of Dragon Flies new to science, which afford evidence supporting the Antarctic Bridge theory.

Mr. Carpenter moved a hearty vote of thanks to the lecturer, which was carried by acclamation.

POLLEN GRAINS OF FAMILIES EPACRIDACEAE, PROTEACEAE AND MYRTACEAE.

(By Miss Agnes A. Brewster.)

The pollen grains of the Family Epacridaceae are very interesting, owing to the fact that in the genius Epacris the tetrads or four pollen grains (daughter cells) have been retained. The four grains of each tetrad are fused, to form a solid mass, and on germination there are four pollen tribes developed, one from each grain of the tetrad. The grains vary slightly in appearance in the different species. Those of *E. obtusifolia* are solid-looking, with a roughened surface, and the tetrad structure can be seen with difficulty. The genera *Woollsia*, *Sprengelia*, *Richea*, also have tetrads. Kerner and Oliver quote *Leucopogon* as having tetrads, and this may be the case with the specimens they examined. Single grains were obtained in *L. virgatus*, *L. ericoides*, *L. lanceolatus*, *L. amplexicaulus*. It will be necessary to test *L. Richei*, for this species grows around the shores of Botany Bay, where the material was probably collected by the early botanists, who sent their specimens home to Europe to be identified.

Astroloma pinifolium is an interesting type, whose pollen grains seem to be in a transitory stage between the tetrads and single grains—there were trios and couples and single grains, as well as tetrads.

The pollen grains of Proteaceæ are very typical of the order. The grains have usually a distinct triangular form, more or less bulged, to look like little pincushions. At each of the three angles are distinct caps of thin walled tissue, forming "corner-caps," for the exit of the pollen tube from one of these. The corner-caps are small in *Lambertia*, and the grain is very regular, with straight edges. This is the case also with those of the Waratah, but in the latter the caps are rounded, yet small. The grains of *Hakea* and *Grevillea* are very similar and very characteristic, with very much enlarged corner-caps, and bulged-looking sides of the triangle. *Conospermum* has grains with distinct corner-caps, which have vertical striations. These grains when placed in water send out pseudo pollen tubes, either from one, two, or three corners, and do it almost as soon as they are immersed.

Persoonia has the three corners of the triangle turned to one side, so as to give the back of the grain a curved appearance, and yet one can still see the triangular outline. *Banksia* shows a grain long and narrow, with only two corner caps, and may be a modification of the triangle—one corner may have been gradually cut off. However, this is merely conjecture.

In the Myrtaceae the grains are again triangular, but with a marked difference (in most cases) from those of the Proteaceae. The Myrtaceous grain, when dry, has either a general smooth outline with no corner-caps showing, or else a sunken dark central triangle, which disappears slowly when the grains are placed in water, the central triangle being a fold in the wall of the grain, and it spreads out as the water is absorbed. Then can be seen three bands meeting in the centre of the pollen grain and one running out to each angle. This is seen in *Eucalyptus, Melaleuca, Callistemon, Leptospermum,* and many others.

The corner-cap also differs from the proteaceous grain in having a button-like cap, and the edges of the extine (outer hard coat of the grain) curved inwards.

Some of the species of *Callistemon* show a marked number of degenerated pollen grains present.

In the Proteaceae, *Stenocarpus,* and *Lomatia* also show what appear to be degenerated grains, with a number of parallel striations, giving the grain a beautiful banded appearance.

SOME OBSERVATIONS ON SOLITARY WASPS AT HAY, N.S.W.

(By T. McCarthy.)

During a recent visit to the Government Experiment Station at Hay nothing proved so interesting as the nest-making habits of the Thread-waisted Sand-digger, *Ammo-*

phila suspiciosa. The wasps were in large numbers, and from sunrise to sunset were continually on the move, scampering over the ground with wonderful activity in their endeavour to find a suitable locality to establish their nest. A slight elevation in the ground is the spot usually chosen by the wasps for their digging operations, and thus each hillcock becomes a mass of independent nests, each carefully disguised by the wasps. No visible signs of the operation of the wasp, therefore, exist, save only a half-finished tunnel, which some wasp had begun, and then, finding it unsuitable, had abandoned. Before starting to burrow the wasp carefully surveys the ground, and having chosen an apparently suitable site, begins to dig. After digging about half an inch deep she may suddenly cease operations and go in search of another site. This procedure is often repeated three or four times before the wasp finally decides the site for her nest. She then rapidly proceeds with the digging operations, using the strong mandibles for digging and the legs for throwing back the finer material often two or three inches from the mouth of the burrow. The larger pellets of earth she seized with her mandibles, and backing upward out of the tunnel, deposited them about one or two inches from the burrow. When completed, the burrow is a simple shaft, with one enlarged cell at its termination, and in this cell is stored the caterpillar on which she lays an egg. As soon as the tunnel was completed the wasp emerged, and after carefully circling round the tunnel entrance, set off at a run across the ground without attempting to fly. After travelling about 15 feet from the tunnel she stopped at a green tuft of grass, and from it seized a green caterpillar, about one inch in length, in her mandibles, and straddling it, commenced the return journey. The caterpillar was quite limp, and had evidently been stung some time previously, as no attempts were made by the wasp to sting the caterpillar, which, beyond a slight twitching, was apparently lifeless when taken off the grass. The journey back to the burrow was accomplished without incident, and the caterpillar dropped just at the edge of the entrance. The wasp then descended the tunnel, probably to see that nothing had interfered during her absence; but soon after reappeared with her head facing the entrance, and seizing the caterpillar once more in her mandibles, backs down the burrow, dragging with her the lifeless body of the caterpillar. After about ten seconds she reappeared, and proceeded at once to block up the tunnel entrance. At first with the aid of the legs, she throws down a quantity of fine earth, ramming it down at intervals with the head by short, sharp rushes. She then collects the larger pellets of earth previously taken from the tunnel, and with the aid of her mandibles, carefully places them in position on top of the finer earth, so as to make a close, well-packed filling. Larger pellets again are then used to fill up the burrow to the original level, and the top is then covered by a leaf, on top of which is placed a few scattered pellets in order to make it as nearly as indistinguishable as possible. So the nest is completed, and the young wasp larvae left to develop underground, the parent wasp apparently taking no further interest in the nest. Some three or four days later I dug up several of the wasp burrows, and in every case a single caterpillar only was found in the cell at the extremity of each burrow. To each caterpillar was attached a small wasp larvae, the head only of which was inserted through the epidermis of the caterpillar, which was apparently dead, except for a slight twitching movement of the posterior extremity of the body.

Another very common wasp in the vicinity of the Experiment Station was the common "Mud Dauber," *Pelopaeus laetus,* a solitary wasp, which has the somewhat curious habit of choosing the interior of human habitations as the spot most suitable for the formation of its nests. The nest is constructed of soft mud, and is built in any part of the room which suits the fancy of the insect. In the laboratory at the Experiment Station two or three of these insects were always present, apparently with the object of choosing a suitable site to build their nest. One of them, after careful searching, chose a spot in the darkest corner of the laboratory, and constructed her nest on the top of a tin on a narrow shelf about five feet from the ground. From the time the door of the laboratory was opened in the morning until closed at night, the wasp never ceased in its work of building the nest. On every visit the wasp carried in her mandible a small pellet of mud about one-eighth of an inch in diameter, and about three or four minutes elapsed between each visit. About 18 visits were required to complete one cell, which is always commenced at the posterior end, and by continual additions of diagonal streaks of mud, the cell is completed. The mud, which is collected from any suitable locality where it can be obtained soft, is moulded into small pellets by means of the mandibles. The pellets are then carried to the nest, where they are carefully spread by the mandibles after being further softened by the addition of the insect saliva. During the spreading the insect makes a continual low humming sound. In this way the nest is soon completed; this particular one, which was composed of 12 cells, taking about three days to complete. The wasp was not in any way disturbed by the presence of any one in the room, as she continually passed me in the course of her work without being incommoded in any way. On one occasion I shifted the nest to a shelf about 18 inches below, to see if she would locate it and continue to work at it in its new position. On returning, to find the nest had disappeared, she was completely dismayed, and after a futile effort to locate the nest, which to all appearances was in similar position to the original one, she became wildly excited, and flew about the room in a menacing manner, so much so that in my own interest I replaced the nest rather hurriedly. On refinding the nest, she quickly calmed down, and after carefully surveying it, resumed her work as if nothing had happened. The number of cells in each nest seems to vary considerable. In the one being described, 12 were present. In two other nests observed, there were three and five cells respectively, while some observers have recorded as many as 50 cells. As soon as each cell is completed, the wasp at once begins to provision it with the food necessary for the development of the wasp larvae. In this species each cell was stored with from three to five small spiders, all of which belonged to the one species, and was the commonest one around the station. The spider is probably stung when the wasp is on the wing, and thus paralysed before being placed in the cell. The spiders, however, are only small, and are quickly devoured by the wasp larvae. The wasp egg is placed on the first spider placed in the cell, and the spiders are eaten one by one in the order in which they are placed in the cell. The cell is sealed up when full, and the young grub left to develop within until it emerges as a full-grown wasp. In the three nests I observed, one cell was always left empty and uncapped by the wasp. Whether it was used as a place of shelter or as a place from which the adult wasp kept a watch over the nest my observations do not permit me to say, but nevertheless seem to me to be connected in some way with the economy of the nest.

Perhaps the most amazing part of all the interesting behaviour of the solitary wasps is the habit of stinging their prey only to paralyse and not to kill it. The advantage of this is obvious. If killed the prey would quickly decompose, and the hatching wasp larva would only have, to it, inedible decaying flesh, instead of the fresh live animal substance it demands. On the other hand, if the prey were stored unhurt, it would, if active enough, quickly escape from the burrow or would succeed in unconsciously crushing the delicate wasp-egg by wriggling about in the underground prison cell. As it is with the paralysed prey, there is no exertion, decomposition is absent, and life without food is capable of being prolonged several days. The paralysis is due to the stinging by the wasp of one or more of the nerve centres of the ventral nerve cord. Insects thus paralysed will keep alive, flexible, fresh, and immovable, as Fabre has observed, for a period of six weeks, a much longer period than is necessary for the development of any wasp larvae. The expertness and accuracy displayed by the wasp in plunging the sting exactly into those parts, the injury of which brings about just that ideal condition of the prey necessary for the sustenance of the wasp larvae, has led some writers to credit the solitary wasps with such human attributes as reason and consciousness. The whole behaviour, however, is perhaps more satisfactorily explained as the result of a complex reflex or instinctive action. Similarly the whole course of nest building, previously described, is a performance wholly for the sake of the young, which the mother will probably never see; and these young in turn will, if females, repeat essentially the same performance without ever seeing such remarkable processes performed. Whether a consciousness of what is being done or an intelligence is being brought to bear on its doing; whether we may attribute to the wasp a psychical state, with its attributes of cognisance, reason, or emotion, are questions which are still debated. The consensus of opinion, however, is distinctly against any such interpretation of the behaviour of the solitary wasps as being due to such anthropomorphic attributes as reason, consciousness, and emotion. The fixity of the characteristics of wasp behaviour, combined with the fact that each female is, from the beginning, able to carry through the complex train of actions without teaching, experience, or opportunity for imitation, practically proves all this seeming marvel of reasoned care for the future young to be an inherited instinct, incapable of modification, except by the slow process of selection through successive generations.

Nevertheless, the great variety in the habits of the species, the extreme industry, skill, and self-denial displayed in carrying out their labours, renders the solitary wasp one of the most interesting groups of the animal kingdom.

NOTES ON THE COCOONS OF AUSTRALIAN MOTHS.

(By Miss Gladys H. Froggatt.)

During the work at the Insect House at Taronga Park many caterpillars were brought to, or collected by me, and placed in the cases provided. A few were lost on account of their having been infested with parasites; but most of them have attained their final stage of growth: a few are still in a chrysalis state. In the cases here are some cocoons, pupae, and perfect moths. The cocoons show several ways in which various moths protect themselves during the weeks of their utter helplessness, viz., the pupal stage.

A caterpillar has varied ways of protecting itself—spines, a gland of offensive fluid to eject at an approaching foe, or it can crawl away from danger. But a pupa is quite helpless in itself, and every caterpillar, in one way or another, makes provision for its protection during this quiescent transforming period. Some seek the soft soil in which to hide their weakness, and others spin silken wrappings to guard them from the cold, wet, and hungry birds, and this tissue envelope is a cocoon.

When fully grown the caterpillar turns aside from its former one occupation (eating) and thinks about protecting itself for its changing pupal state. It does not look like the vigorous creature it had been whilst thriving on leaf pulp. Generally it loses its bright coloration, and shrinks in size, just ere it begins to spin. It spins by means of spinnerets in the lower lip, and to and fro, hither and thither, the tireless head moves unceasingly, criscrossing the strands until it is entirely encased in a web of silk, secure and firm to protect the pupal change.

The cocoon is not only pure silk mesh, for it has mixed with it fat, wax, gum, pigment, etc. Only about 50 per cent. is pure silk. The silk issues in a thin, quickly hardening, liquid stream.

1. Cocoon and enclosed pupa of a moth, Genus *Teria.* This caterpillar makes a cylinder-shaped cocoon of a light wrapping of silk, shooting out loosely among the mesh the hairs upon its body, which had been its protection in its larval state.

2. Caterpillar, cocoon, and a moth, *Anthela censors.* This woolly bear caterpillar encloses itself in an outer envelope of loose silk, surrounding a very thickly-felted cell, and moreover, to protect itself further it spins the cocoon between the scaly bark and the tree trunk.

3. Cocoon of *Entometa fervens,* with pupa within. This is very like the cocoon of the Indian silkworm moth; it is very closely spun, giving it a beautifully finished appearance. It is quite a hard cell, and the green coloration is a perfect example of protective mimicry.

4. Cocoon and moth of Australian silkworm moth, *Antheraea eucalypti.* We had very many of these insects brought in, and all had big appetites. Only one was at-

tacked by a parasite, which destroyed it when a pupa. The cocoon is of very thick dark-matted silk; but despite the profusion of silk, it is most difficult to unwind, even in hot water, though several allied Indian silkworms produce good silk. The moth cuts its way out with a sharp spine on the shoulder, the friction sounding like the gnawing of a mouse. The moths emerged in the early part of February, and eggs laid in the cages were hatching on February 16th.

5. Cocoons of cup moths, *Limacodes longerans* and *Doratifera vulnerans.* The cocoons of the cupmoths are entirely different to those of the silkworm moths. They are smooth and hard, almost like the twig itself. These oval tough cocoons are attached on their sides to the twig. The apex of the cocoon forms a circular lid, which the larva gums down securely, but which is loosened and pushed out by the moth when ready to emerge.

6. Cocoon of the Ribbed Casemoth, *Thyridopteryx herrichi.* This is not only a cocoon, since the caterpillar begins to build it, when very tiny, as a little cap, travelling everywhere with it, with only the head and forelegs peeping out, enlarging it as needed. When the caterpillar is fully grown it fastens its little home to a twig with a silken wrapping, and pupates within. The male, when matured, cuts his way through the bottom of the case, a perfect winged moth; but the female never leaves her home, never growing wings, and is just a wingless, deformed sort of creature. Her eggs hatch in her silken bag also.

7. Cocoon of *Metura elongata.* This casemoth also does not wait to be a fully-grown caterpillar to use the protection of its silk. When very small, it spins a silken bag, strengthened with short bits of stick nibbled from the food plant matted in; the lower ones often being longer than the case. It looks a heavy case for a caterpillar to carry constantly.

8. Cocoon of the Faggot Casemoth, *Entometa ignobilis.* This, too, is a casemoth; but in this instance the bag is more symetrically woven, all the stout sticks being laid parallel to each other, so that it looks like a bundle of faggots, hence its name.

9. Cocoon of the Leaf casemoth, *Thyridopteryx hubneri.* This leaf casemoth caterpillar does not keep to one kind of food plant, but it is generally gum leaves or pine needles that it chooses to bedeck its bag with. The leaves are not wholly matted in, but are just lightly fixed to the bags by their upper edges.

10. Cocoons of the brown Bat moth, *Chelepteryx collesi.* The cocoons of the Bat moth are among the largest of the caterpillars about Sydney. Neither caterpillar nor cocoon are easy to handle, because of their spines. When the red-brown, bristly caterpillar is fully grown it begins to spin its cocoon, not shooting out its spines till it is well enclosed in silk; but when it does so, the cocoon is as prickly as a cactus. One of these caterpillars spun a lot of loose silk into a delicate mesh, and then abandoned it. One of these cocoons contains a live pupa now.

11. A similar spiny cocoon of a moth whose name I have not yet discovered.

12. Cocoon of the Painted Moss moth. This is a dark little heavy felt bag, with a long neck.

13. Cocoons of *Hepialus exima.* This caterpillar feeds on the stems of waterguns, and forms a felted loose bag all round the branch, and is said to remain in the larval state for nearly a year. The bag shelters the pupa, which is in a cavity in the interior of the twig. It eats the web off in front of the cavity just before it pupates, and puts a wad of felt in its place. The horny pupal head of the moth will push this wad out when it is ready to emerge.

NOTES ON APINA CALLISTO, THE CROW'S-FOOT CATERPILLAR.

(By E. E. Larcombe.)

Plates I. and II.

The crow's-foot, *Geranium dissectum,* is available for fodder in the Trangie district from June to September. The caterpillar, which destroys large quantities of this fodder, pupates early in spring, and remains underground during the drought conditions of summer. This year, immediately after the April rains, the moths, which fly low over the grass in the daytime, appeared, and were numerous for about 21 days, when a second fall of rain seemed to exterminate them.

The shoulders of the moth are particularly strong and specially adapted for working the insect out of the ground. As no emergence of the moth was noted so far in the daytime, this probably takes place in the early morning, or even during the night, when the surface of the ground is moistened by the dew.

The eggs found were laid singly, and were spherical in shape. In about six weeks' time the young caterpillars were observed feeding on the growing crow's-foot.

When full-grown and ready to pupate, the caterpillar leaves its feeding place and searches for a suitable situation to commence operations, tapping the ground here and there with its front legs and jaws, evidently to test its hardness. After selecting a bare patch, the caterpillar bites the earth and works it up into little pellets about as large as a pin's head. Then, swinging the fore-part of its body to the right or left, it deposits the pellet some inches away, while it brushes the surface of the ground at each outward sweep with its forelegs.

This operation is repeated until a cylindrical hole is bored to the full depth of the caterpillar's body, although it always maintains a grip of the surface with its claspers. Next, it clears away the pellets from all around the opening, and then enters the hole tail first.

To seal up the entrance, it removes the soil from all around, and thus makes a slight dish-like depression, while it plasters up the entrance bit by bit, first working with its head projecting, then as the hole gets smaller it finishes the sealing up process from the inside, and makes a neat job of it.

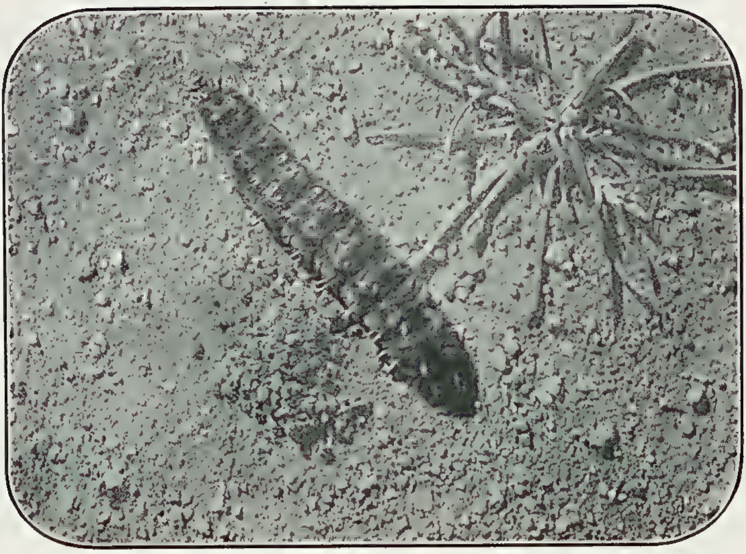

Fig. 1.

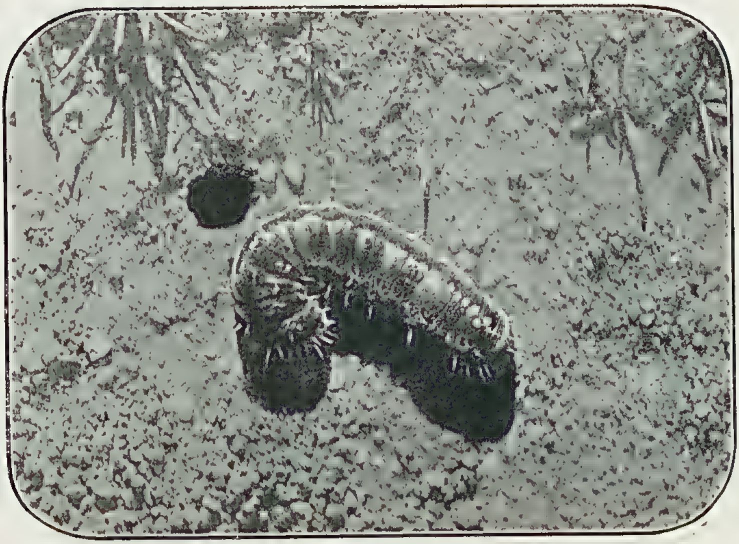

Fig. 2.

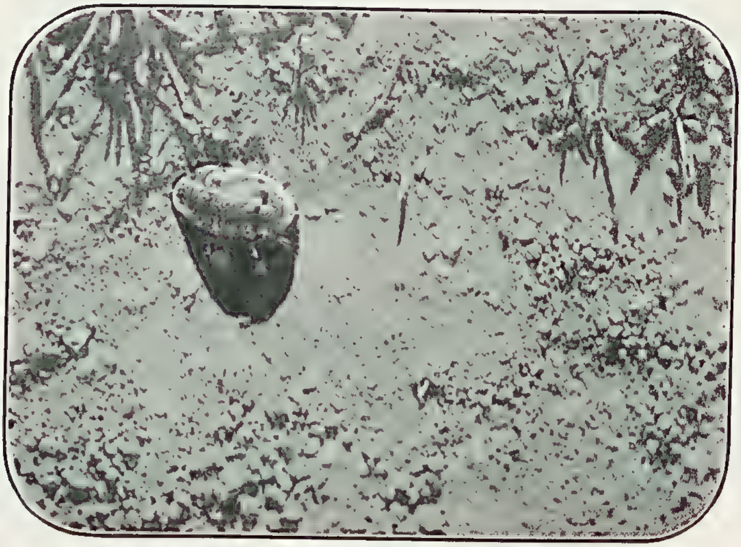

FIG. 3.

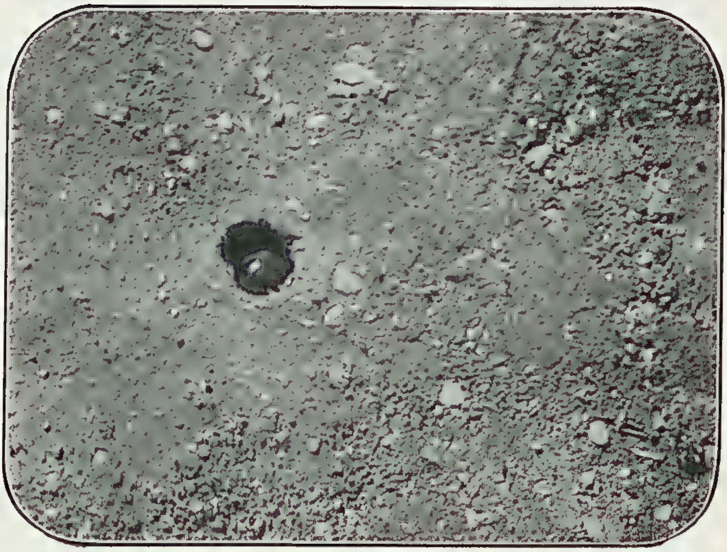

FIG. 4.

The time taken to go underground varies from eight to ten hours, or longer. It is several weeks before a pupa case is formed.

The plenteous rains this year seemed to kill off many caterpillars before they pupated, while they are also attacked by one of the ichneumon flies.

Description of Plates I. and II.—Fig. 1: Caterpillar commencing to make its burrow when ready to pupate. Fig. 2: Caterpillar resting after forming the burrow. Fig. 3: Caterpillar half buried in the soil while making the burrow. Fig. 4: Caterpillar closing the opening after entering the burrow.

NEWCASTLE SCIENCE AND ARTS SOCIETY AND FIELD NATURALISTS' CLUB.

The excursion of the members of this Society to Merewether Banana Plantation was made from Beachtram terminus, and up the ridge, in a westerly direction, through the bush.

From the high ground fine views of the ocean beaches from Merewether to Redhead were appreciated, and on the other side the whole district, including the Newcastle Steelworks, the Government works on Walsh Island, and the Hunter River. While traversing the ridge several botanical specimens were collected.

On arrival at the plantation, Mr. Bailey conducted the party over the different sections; plantains occupied ten acres out of the 75; some "finger" bananas being located in another part of the grounds. Lemons, loquats, oranges, etc., were also in good form.

The transformation of "Murder Gully" by cultivation into a garden shows what can be done by patience and perseverance. The plantains take two years to mature, and grow to a height of ten to twelve feet. Only one bunch of fruit can be gathered from a single stalk, and the suckers form the next year's plants.

February is the month to see the plants in best condition. The gully is very deep, and a very ingenious wire ropeway has been constructed, by means of which a horse windlass draws the fruit up to a landing stage. The plantation can be approached by a 25 minutes' walk from the Glebe tram terminus.

NOTICE TO MEMBERS.

It is proposed to hold a "Fair" early in September in aid of the War Funds of the Y.M.C.A.

To those members who have not yet been advised of this, I would state that the Fair will take the form of an Exhibition of Natural History Subjects, a Wild Flower Show, and through the kindness of some of our lady friends a series of stalls will be arranged for the sale of the exhibits, sweets, cakes, etc., also a refreshment stall. A committee of ladies is being formed to arrange stalls, etc.

I am not appealing to you for monetary gifts. I want men who will undertake to provide suitable wild flowers for sale. Native plants in pots. Ladies who will knit socks, make cakes, sweets, etc. Everyone to give something to make this Fair a success, and in so doing to think of our own Members who have offered their lives for the honour of our country, and to send them a message that will hearten them and make them proud to be connected with our Society.

I want to get £300, and to do this a two (2) days' Fair will be necessary. The call is "En Avant Comrades!"

—D. W. SHIRESS.

NOTES AND COMMENTS.

BEE BREAD.—It is interesting to note that on examination I found that the Bee Bread taken from the cell of the nest of the Mason Bee was composed of pollen from myrtaceous plants, such as *Leptospermum, Meloleuca,* etc.

—AGNES A. BREWSTER.

OBITUARY.

It is with the deepest regret that we record the deaths of the following friends:—

Mr. Sutherland Sinclair, Secretary to the Australian Museum, who died early in May after a long illness. Mr. Sinclair, who was a native of Greenock, Scotland, had been connected with the Museum for a long series of years, and was thus well known in scientific circles. He took a deep interest in the welfare of the young, particularly in connection with Sunday School work, with which he was all his life actively associated. He recently presented to the Presbyterian Church Offices his very fine library of works dealing with Sunday Schools and their teaching.

Mr. Alfred John North, Ornithologist to the Australian Museum for over 25 years, died suddenly at Chatswood on 6th May. Mr. North had been in indifferent health for some time past, but until quite recently he carried on his work at the Museum. He was the author of numerous papers on Ornithology, and his principal work was the fine volume on the "Eggs of Australian Birds," published by the Museum Trustees.

Mr. Dene B. Fry, killed in action with the A.I.F. in France on April 9th, was a young man of great promise. During the six years in which he was employed as a Zoological assistant at the Australian Museum, he became an expert in the study of Frogs and Lizards, and published a number of remarkably able papers, particularly on Frogs. At the time of his enlistment he was a student at Sydney

University and a demonstrator in Zoology under Professor Haswell. In May, 1915, he joined the A.M.C., in which capacity he made two voyages in hospital ships. He then transferred to the infantry, and passed through the Officers' Schools at Moore Park and Duntroon, qualifying as lieutenant, but left as a sergeant in August, 1916, in order to avoid delay in getting to the front. Mr. Fry's younger brother, Alan, was killed in France just about the time that Dene sailed from Australia. The passing of Dene Fry is a very heavy loss to science in Australia. He was a most painstaking and thorough worker, and those who were associated with him looked forward to his having a brilliant future in scientific research. But alas! it was not to be. "Vitam pro patria dedit."

Mrs. W. J. Rainbow, wife of our respected fellow member, died on June 6th. Mrs. Rainbow never recovered from the terrible shock caused by the death of her second son, Oscar, at Gallipoli, where he was killed in the performance of a very gallant action in throwing a bomb out of the trench and thus saving the lives of his comrades.

The deepest sympathy of members of the Society will be accorded to Mr. Rainbow in his heavy trial.—Ed., *A.N.*

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BOTANIC GAR
and
NATIONAL HER

THE
Australian Naturalist.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.

3rd July, 1917.—Mr. W. W. Froggatt, F.L.S., Vice-President, in the chair, and about 35 present. An apology from the President for unavoidable absence was received.

Messrs. H. D'Arcy and F. Carmichael were elected members. Messrs. H. Zeck and N. Hewison were appointed auditors.

Mr. G. A. Waterhouse delivered a lecture on "The Distribution of Australian Butterflies," which proved of exceptional interest, and was illustrated by beautiful series of specimens.

ANNUAL MEETING.

4th September, 1917, held over from 7th August, owing to stoppage of rail and tram services through strike.

The President, Mr. A. A. Hamilton, in the chair, and 35 members present.

The Annual Report of the Council was read and approved. The Hon. Treasurer submitted his Annual Statement, which was adopted.

The Office-Bearers as set out in list on page ii. were duly elected.

The subject chosen by the President for his address was "Work For Field Naturalists." The address is printed in present issue. A series of Desert Plants, collected by Mr. W. M. Carne, on active service in Egypt, was exhibited by the President.

On the motion of Mr. F. W. Carpenter, a vote of thanks to the President for his exceedingly interesting and instructive address was carried by acclamation.

The President-Elect, Mr. E. S. Edwards, M.A., was installed in the chair, and in a happy speech thanked the members for the honour conferred on him.

A hearty vote of thanks to the retiring officers, and especially to the Hon. Editor, Mr. T. Steel, F.L.S., and the Hon. Lanternist, Mr. C. J. White, was proposed by Mr. Cheel, and carried by acclamation.

Mr. Shiress exhibited a pink form of *Thelymitra ixioides,* found growing near Hornsby.

ANNUAL REPORT.

In presenting this, the fourth Annual Report of the Society, your Council takes the opportunity to congratulate the members on the fact that, despite the war, our membership has been well maintained. The attendance at the Monthly Meetings averaged 43, which, under the existing state of things, is creditable. Our outings, however, have been poorly attended, due, no doubt, to the many calls upon the time of the members, owing to the pressing need for relief work for the benefit of our soldiers abroad.

The following outings were held:—La Perouse, Killara, Heathcote, Hornsby to Mr. R. J. Tillyard's, Long Reef, Gosford, Gordon, Taronga Park, Heathcote. The Easter Excursion was abandoned as a mark of respect to our members serving abroad.

We have to extend our sympathy to those of our members who have lost loved ones, and more especially with our old and esteemed member, Mr. W. J. Rainbow, F.L.S., in the loss of his life's partner.

During the year a Branch Society was formed in Newcastle by the Newcastle Arts, Science, and Natural History Society amalgamating with us. To mark the occasion, some 40 members, under the leadership of Mr. A. A. Hamilton, President, met the Newcastle Branch at Gosford, under Mr. Sussmilch, and a pleasant and profitable time was spent.

The following lectures were delivered during the year, and we take the occasion to officially thank the lecturers for their kind efforts on our behalf:—

Mr. A. S. Le Souef: "The Animals of Australia, with Notes on Variations."

Dr. S. J. Johnson: "Snakes and Lizards.'

Mr. E. Cheel: "Myxies" (Myomycetes).

Mr. W. W. Froggatt, F.L.S.: "Birds of Riverina."

Mr. W. H. Dudley Le Souef, C.M.Z.S.: "The Nidification of Australian Birds."

Mr. Walter F. Gale: "The Sun and Some of its Phenonema."

Mr. R. J. Tillyard, F.L.S.: "Natural History of Cradle Mountain, Tasmania."

Mr. G. A. Waterhouse, F.L.S.: "Distribution of Australasian Butterflies."

Three members' nights were held, and excellent papers read by Miss Froggatt, Miss A. Brewster, Mr. T. McCarthy, and Mr. H. Zeck.

We regret to state that owing to the scarcity of paper, and the consequent high price of same, it has not been possible to publish the promised catalogue of Plants of the County of Cumberland. We hope to have this much-needed publication out as soon as possible.

We have to thank those of our members who have so kindly undertaken the task of leaders of our excursions, and to the members who have contributed articles to the *Australian Naturalist.* The pages of the paper are open to all members, and we would again urge the leaders of excursions to send in reports of the outings. The paper has a wide circulation, and it is our duty to furnish Field Notes and observations for the benefit of the outside world.

Your Council would also urge upon members the necessity for taking an active interest in the Society, and would like to see an annual selection of Councillors. Whilst not deprecating their own efforts, it is felt that an infusion of new blood would help to maintain an interest which the Council feels is lacking.

The thanks of the Society are also due to our Hon. Editor, Mr. Thos. Steel, F.L.S., and our Hon. Lanternist, Mr. C. J. White, for their kind exertions, and Mr. G. A. Waterhouse for the use of his rooms for the Council Meetings.

D. W. C. SHIRESS,
Hon. Secretary.

PRESIDENTIAL ADDRESS.

WORK FOR FIELD NATURALISTS.

(By A. A. Hamilton.)

It is a moot question as to how far it is advantageous for a society of Field Naturalists to adopt a "Medes and Persians" attitude towards rule and regulation. Australian communities have occasionally been adversely criticised for their lack of organisation, yet we find in many instances the cohesive faculty strongly developed, whereas, if a hard and fast system had been adopted, it would probably have proved too irksome for many of our liberty loving people. It is possible, however, to carry our individualistic propensities to such a length that the usefulness of a society may be considerably impaired, and this brings us face to face with the problem as to whether the lines on which our Society is conducted are wholly, or in part, too rigid or too elastic. It certainly appears from our Annual Reports that although we receive a considerable influx of members, we are unable to hold them. The Society has lost much of its earlier character. It was originally an association the majority of whose members were expert scientists, in fine, a field replica of the Linnean Society. Many of the earlier members, while still retaining their membership, have drifted out of the sphere of our activities, and the majority of those who now form the Society are more or less amateur scientists, perhaps better described as "Nature-Lovers," who require guidance to enable them to follow the complex methods adopted by "Dame Nature," in her wondrous provision for the continuity of her numerous races, and the protection during their brief span of existence of her fauna and flora. This change has set up a new relation of members to each other, and the position now disclosed is that of a section consisting largely of experts disseminating information on subjects relating to Natural Science to others who have had little or no training in systematic nature study. Briefly, the function of the Field Naturalists' Society has become largely educative, a fact which the Department of Education has recognised by granting us the use of this fine Assembly Hall, wherein to hold our meetings. While a considerable numerical membership continues, and a fair attendance at meetings and excursions is maintained, Lecturers and Field-leaders will be more or less in evidence, but when—as is unfortunately too frequently the case—the attendance is limited, the busy worker will hesitate to devote the time and attention necessary for the preparation of a lecture, or be prepared to forfeit an afternoon to field-work, for the benefit of an indifferent audience. In these circumstances it may be advisable to consider the question of providing a sphere of activity of an interesting character for our non-professional members, with a view to enlisting their services in making observations upon unusual occurrences, and investigating imperfectly known episodes in the life-history, distribution, etc., of our fauna and flora. Hitherto we have been at a loss for a local botanical work with a technique within the compass of the lay reader; but the publication of a simply-phrased, comprehensive text-book, containing a wealth of examples from our State flora, by our talented lady members, Miss A. Brewster and Miss C. Le Plastrier, should go a long way towards the removal of this disability. Assisted by this work, members, especially those who have had the privilege of making field excursions under the leadership of Mr. E. Cheel, and the advantage of listening to his lectures, and the explanatory notes on his numerous exhibits, should now be in a position to enter upon the work of investigating some of the simpler phenomena presented by our Native Flora. The kindred subject, Entomology, with its numerous votaries, has been well catered for by Mr. W. W. Froggatt, ably supported by Mr. Gurney, and it has acquired an added interest by the publication of a monumental work on Australian "Butterflies," by Mr. G. A. Waterhouse and his colleague, Mr. Lyell, and "The World of Little Lives," the ably written production of Miss Gladys Froggatt. The activity of this section, always well maintained, has been considerably enhanced by the carefully collated studies of insect life by Miss Mabel Brewster, the numerous and valuable notes on the habits of "Caterpillars" by Mr. Wickham, and the painstaking exhibits of "Moths," with accounts of their life-histories, prepared by Mr. Luke Gallard. The investigations now being carried out by Mr. Zech on intruders in Ants' Nests, will doubtless disclose some interesting features, and further contributions from Mr. Macarthy will be looked for with pleasurable anticipation. Mr. Carpenter is also taking up a section of entomological study, which promises interesting results; and Miss Froggatt, in addition to providing the book above quoted, has contributed some excellent notes to our journal. The results attained by these workers are of a character conducive to the encouragement of other members to venture into this practically unlimited field of research. It must not be forgotten that Naturalists are mortal, and as our older members retire, or their contributions diminish, it is essential for the maintenance of the Society that other workers should be ready to occupy the vacated positions. The superficial aspect of "still life" presented by plants, and their gradual and frequently inconspicuous movements, are probably less attractive than the more palpable metamorphoses of the fauna, yet there is much of interest in the "Plant World" which may be obtained without the aid of either microscope or an elaborate laboratory outfit. Although it is desirable that observations should be made on indigenous plants growing under natural conditions, much preparatory work may be accomplished in the home garden. The results obtained by Mr. Cheel in the cultivation of Field-Beans might be cited as an example. New forms brought about by artificial breeding, which, by the way, are few, and those occasioned by the intervention of nature, which form the major portion of our new varieties, are indicative of the evolution of new botanical species and varieties among the indigenous vegetation, and as these "breaks" frequently occur in our garden plants, opportunities for their investigation are more readily available than in the case of their "bush" confreres. In nature we are dealing with unstable material, which is constantly presenting a new facies. Though no two individuals are absolutely alike, it is difficult in many instances to provide, in a descriptive work, characters sufficiently constant to definitely fix a species so that it may be readily recognised and differentiated from its allies. As a consequence, this knowledge cannot be acquired exclusively from text-books, but must be supplemented by field work, so that the habits of the subject, and the environment in which it exists, may be studied in conjunction with its morphology. A study of the effects produced on plants by environmental conditions comes well within the province of the observant Field-Naturalist, to whom a cursory examination of the flora of the Strand, or Salt-marsh. will disclose characters in the various habitues of these regions which have palpably been developed to meet the exceptional conditions obtaining in their chosen habitat. The adaptations of plants to the exigencies of existence in an aquatic element can well be studied by the aquarium keeper in conjunction with its piscatoral inhabitants, or a very small artificial pond will provide an opportunity for observation of the characteristic growth and development of our "Sun-dews" and "Bladder-worts," and other quaint forms of Pond vegetation. The geographical distribution of our indigenous flora, with special reference to local species with a limited range, and the fixation of their occasionally well defined boundaries, might, in conjunction with the domiciliary preference of plants for certain geological formations, yield a considerable amount of interesting data to the worker who would undertake the task. The natural instinct of the gardener—our common heritage—might be devoted to testing the adaptability of our native plants to changes of environment. Mr. Shiress—our genial Secretary—has, I understand, met with a considerable amount of success in this field of work. The manner in which plants extend their boundaries and colonise new territories by means of their seeds, the dispersal of the latter by the agency of the wind, ocean currents, animals, and mechanical explosive devices, affords a wide scope for nature study. (We have in the National Herbarium an interesting collection of drift fruits, many of which were collected on our local beaches by Miss Lily Parkes.) The observations of a former President of this Society, Mr. A. G. Hamilton. supplemented by the carefully collected data, comprising the history of the pollination of *Darwinia fascicularis* Rudge, by Miss A. Brewster, has paved the way for similar work by nature students. In view of the numerous suggestions contained in the publication previously referred to ("Botany for Australian Students"), it is unnecessary to deal at length with the opportunities for interesting field work open to our members, the results of which would no doubt be gladly welcomed by the Editor of our journal, Mr. Thos. Steel, F.L.S., to whose kindly censorship and capable assemblage of the salient features in an abstract from an author's notes, the contributors to the journal are much indebted. The primary difficulty which assails the student is the much-vexed question of nomenclature. A knowledge of the scientific name of a bird is not essential to the enjoyment of its handsome plumage, or its musical note; but when the universal desire to exchange views on the subject with our fellows is in question, the difficulties arising from the lack of a name by which a plant or animal may be mutually recognised becomes apparent. A common name which will pass current in a limited circle may be readily agreed upon by its members, but another such circle operating elsewhere is not bound by its decisions, and is free to elaborate an entirely different set of names. As the plants and animals are not confined to the area of investigation considered by either circle, the confusion which must arise from this multiplicity of names is apparent. That no system of classification will give absolute satisfaction, is merely an admission of human fallibility, but a system founded upon the observations of trained scientists, who have devoted a lifetime to this study, and arranged upon a basis agreed to by those best qualified by actual experience to form a judgment, is more likely to bear the test of practical usage than the amateur efforts of those whose knowledge of this exceedingly intricate subject is of a superficial character. The popular appeal for simplicity is the articulate expression of the law of motion seeking the line of least resistance, and arises from inability or disinclination to devote sufficient time and attention to the acquisition of the information necessary for the pursuit of this study. There is no "royal" road to knowledge, and attempts in this direction are reminiscent of the search by the Alchemists of old for the "Philosopher's Stone." Nature guards her secrets jealously, and it is only to those among her votaries who exercise to the full their powers of observation during lengthy and patient vigils, that her mysteries are revealed. It is not, however, with nomenclature alone that the Naturalist is concerned; names are but a means to an end, and a few well-known local plants or animals will provide a field for observation which will fully occupy all the leisure available to the non-professional worker for this pursuit. The aim should be an intimate knowledge of the history and habits of a few examples, rather than loose generalisations covering a wide field of enquiry, as so much already well-trodden ground must be traversed before any original work can be undertaken. Science is defined as a systematic arrangement of facts, and carefully conducted observations, with their methodical record, should be the keynote for all work, either in the field or the laboratory, as careless or inaccurate records cause endless confusion. The presentation of the subject in narrative form renders it more attractive to the lay reader, but this *Facilité de plume* is a gift which must be carefully exercised, as there is an ever present danger that a very plain fact may become a highly-colored sacrifice to the Moloch of popularity.

EXCURSION TO HEATHCOTE.

A whole-day excursion was held at Heathcote on Saturday, July 7th, under the leadership of Mr. F. W. Carpenter. The party walked from the station to the bottom of a neighbouring gully, in which runs a small creek tributary to the Woronora River. Many of the members were loud in their praise of the beauty of the gully, and it is hoped to hold another excursion in November at the same place. As the water will be warmer, there should be opportunity to enjoy a bathe in some of the larger pools, and also to search for the larvae which live in deeper water. Many of the insects found in the larval state in July should be on the wing in November, whilst in any case their larval development will have progressed through many instars.

On account of the distance, the excursion is not recommended for those who can only spare the half-day.

On the way down the gully the party visited a large cave, with a sand-strewn floor, on which were the footprints of many birds and small mammals. After leaving this, the botanists explored the bottom of the gully, under the lead of the President, Mr. A. A. Hamilton, who has kindly written a note on the special characteristics of the flora.

The remainder of the party spent the day searching the creek for aquatic specimens. We are greatly indebted to Mr. R. J. Tillyard, M.A., B.Sc., for his kindness in identifying the specimens.

Many larvae were obtained by diligent dredging of the water-weeds, and these were carefully examined alive in a shallow white dish full of water. The larvae of the dragonfly, *Lestes cingulatus,* were found in various stages of development, and in some the budding wings were clearly visible. The fine caudal gills of this genus were pointed out. Shrimps were obtained in abundance, and their digestive tract could be plainly seen with the naked eye; but best worth watching was their very beautiful gill system. The whirligig beetle, *Macrogyra,* and the water-boatman, *Notanecta,* were both found on the weeds.

An abundant fauna was discovered on the under surfaces of submerged flat rocks. The small conical cases of the caddis larva, *Helicopsyche,* were seen to be built of fine sand grains; whilst the green transparent pupa of *Hydropsyche* was found hidden amongst the little mound of pebbles firmly secured to the rock which serves as a shelter from the larva of this genus. The active larvae of the mayfly, *Atalophlebia,* proved most interesting when examined with a lens in a bright light, the rapid rhythmic motion of their gills being specially fascinating. Several interesting dragonfly larvae were collected, including *Aüstrocordulia refracta, Aeschna brevistyla, Hemigomphus heteroclitus;* the latter were obtained by careful searching of the clean sand of the creek bed, whilst the *Aeschna* larvae were best obtained by dredging the vegetable debris.

The larger dragonfly larvae were put into a dish, with a little fine mud amongst the water. This served to detect the current of water, which is ejected from the rectum with sufficient momentum to cause the forward propulsion of the larvae. In such cases the gills are internal, and line the walls of the rectum; they absorb the oxygen from the water before it is ejected. The more rapid the swimming movement the more abundant is the supply of oxygen for respiration. This method of propulsion was actually tried on an experimental scale for the propelling of boats, but proved inferior to the screw.

It is worth notice that in many cases the dragonfly larvae were in various stages of development. Thus, by patient search, it was possible to see a considerable portion of the life-history without the long waiting so often necessary in the case of certain other genera where the individuals are all of the same age at a given time.

F. W. CARPENTER.

A TRIP TO THE NEPEAN.

(By D. W. C. Shiress.)

"Turn off at the Blazed Trail leading to the new pumping station on the 'Bargo, and you'll be all right, you can't miss it," were our parting instructions as Mr. Bott and the writer set out to locate the Nepean River from Hill Top. ,

Although the trail had been recently blazed, to permit the residents of the eleven mile camp to catch the train at Hill Top, instead of taking an expensive coach journey into Mittagong, and as we afterwards discovered, was easy to pick up if you happened to know where to locate it, fortunately we missed it, and although we were at the time rather sore on the subject of being chaffed as new chums, we determined to follow our original intention of striking across country due east, and find the river at any cost. An hour's walk found us at the Bargo, about three miles up from the pumping station, and the opposite bank gave us food for reflection. The country about the Bargo is as rough as sandstone country can be, and the bank facing us wore a "don't-touch-me" look, and so, fearing the worst, we tackled it, to find that, like most difficulties, they look worse than they really are. We landed on a level spur of the plateau, and an easy walk of twenty minutes brought us to the Goulburn Road and the Railway Deviation Works.

We were for keeping straight on, as the country seemed perfectly level, but unfortunately, took the advice of a ganger, who assured us that ten minutes back along the works a party of men were working who had found a track to the Nepean, which they would point out to us; so, with light hearts, we set out. That ten minutes was like unto the proverbial bush mile, and extended into one hour fifteen minutes; that is, from the 73 mile peg back to the 69 mile; although it was a pleasant hour, for we came across our first Jacky Winter (*Microeca fascinans*), and learnt that the white-throated Tree Creeper (*Climacteris scandens*) had a very melodious call. The Jacky Winter of the tableland is more definitely marked than the Jacky we are used to in Sydney. His breast is much lighter in colour, and shows out prominently; while he has a white feather in his wings—but does he sing? We heard him not, and failed to find anyone who had heard his melodious song.

Two thousand feet above sea level, an early Spring day, with *Acacia decurrens* var *mollis* in full bloom, and a Jacky Winter coquetting along the road in front of you from post to post, make a soulful combination, and you feel as if you belonged to some other world, and that time and distance were things of the earth, a place you have a vague feeling about.

A Spine Bill (*Acanthorhynchus tenuirostris*) was not of our mind, however, as he was busily engaged having his midday meal of flies, which were very plentiful on the Acacias; and a white-throated Tree Creeper was also searching for food, and gave us an exhibition of his powers by descending a tree backwards, "cheep cheeping" all the way. A scarlet-breasted Robin (*Petroica leggei*) helped to complete the enchantment of the day.

Although the flowers were represented solely by the Acacias, (*discolor,* with its pale and orange flowers, was in evidence), a magnificent *Eucalyptus punctata* gladdened the landscape with its wealth of new claret-coloured foliage framed in sunshine, and its slaty-coloured bark, punctuated with blotches of reds and yellows—colours that man, seemingly, is unable to reproduce.

The reports of blasting operations notified that our ten minutes was closing in, and a man frantically waving his hat made us pause to watch the results of seven columns of smoke issuing from the cutting, and brought us back to earth with the crash of seven explosions.

A chat with the men elicited the fact that we would find a very indistinct track on the opposite side of the cutting, and with a "so-long," we set out for the Nepean and lunch.

The track soon gave out, but as we were on a ridge with precipitous creeks on either side, it mattered not, and half an hour's walk through typical sandstone flora, scribbly gum, *E. haemastoma,* with its fine-leaved variety, *Rossii,* an occasional *eugeniodes* and *punctata,* until at last, through a clump of *Casuarina suberosa,* we catch sight of a silver streak some 1,200 to 1,500 feet below us. Searching round for a place to descend, we pick up some cattle tracks, and so down and round and round and down we at last reach water, at the only spot, as far as we could see, where it could be reached without the aid of a rope ladder.

What a picture was open to our gaze! We had evidently struck about the centre of a V-shaped valley. The murmuring of a waterfall to the south was distinctly audible, and we should have probably have struck this had it not been for our ganger friend. Opposite, a steep creek had cut into the cliffs and formed a spit of a few acres, which was covered with Acacia floribunda in full bloom—a truly golden dream. The view up and down the river was very fine, and some fine Eucalypts on the opposite side, at the foot of the cliffs, had the appearance of "terete-cornis." We wished that we had sufficient food to have made a camp amongst the Acacias for a few days and explored the country.

Owing to the dryness of the season, very few plants had made growth, and beyond *Senecio vagus, Craspedea Richei, Indigofera Australis,* few flowers were noticed. *Dodonea multijuga* was very plentiful, as also *Humea elegans,* which I noticed the cattle had been cropping, although there was plenty of good grass on the river's bank. Half an hour is not sufficient to do any serious work in, and so, after a smoke, it was time to retrace our steps. Zig-zagging back, we made good use of the *Casuarinas* and *E. punctata* to help us up the Brae. A flock of King

Parrots (*Aprosmictus cyanopygius*) were busily engaged chatting amongst the Eucalypts, and we had a good opportunity to note the striking difference between the scarlet-coated male and his mottled green partner. While resting again a *punctata*, about half-way up, the grandeur of the scene at our feet absorbed us, and we wasted precious moments drinking in the picture. The opposite bank rose in a massive sandstone cliff, apparently some hundreds of feet higher than the bank we were on, and suggested that to reach Mt. Kembla, near the coast, an aeroplane would be necessary.

As "Nae man can tether time nor tide," and we had to pick up the blazed trail on our way home, we reluctantly turned our backs on the picture and resolutely scaled the rest of the distance. On the level again we could pick up the "gib" at Bowral, standing out sentinel-like over some of the weirdest country in New South Wales.

We saw a pair of birds, probably Pallid Cuckoo, but they were very wild, evidently civilisation and its gun had disturbed the equanimity of their lives. Some scrub wrens refused to be identified, although we had a copy of "Leach" with us for the purpose, and gave us a lively chase.

Picking up the "Devvy" again we followed a cart track, and soon had the satisfaction of passing through "Canvas Town" at the eleven-mile peg. This home of the "navvy" looked very picturesque amongst the gum trees, and was reminiscent of the gold diggings, only that it was laid out in squares, and had a permanent supply of water stored in a vast array of tanks, and pumped from the "Bargo," two miles away.

Two stores, two fat women, and a new chum in full feather, made us feel that we had dropped from the clouds into the turmoil of life once again. Chummy had not heard of the "Smiddy" where we should have reported, nor did he know where the pipe line was, and we wished afterwards that we had remained in blissful ignorance of its whereabouts.

The sun was getting very low as we stumbled, climbed and slid over that two miles of pipes into the Bargo, where we unburdened our souls, and pulled up our socks, literally, for the climb out of the river. The blazing was ultimately found, and we entered upon the trail, weary and anxious, for the country had been burnt out, and the prospect of a camp without shelter, water, or food was not inviting, and would have been an excellent opportunity to test Mark Tapley's optimistic theories. What a long, dreary tramp that was, and what a relief to reach a well-defined track in the gloom, for the sun had set before we were through. Then the exquisite pleasure of sitting on the earth with your pipe drawing free, and the "black dog" cast off your back, unthinking and oblivious to everything save the glow of your pipe—moments of bliss that follow effort. We had opened up communication with the Nepean from Hill Top, located the Blazed Trail, and naught else mattered.

REVIEWS.

"The Biology of Dragonflies," by R. J. Tillyard, M.A., B.Sc., F.L.S.

Many of our members who have the privilege of knowing Mr. Tillyard will join with us in congratulating him on the publication of his book, "The Biology of Dragonflies." The book is issued by the Cambridge University press, and although its publication has been long delayed through the war, it has not suffered in any other way, and its whole appearance reflects the greatest credit both on the author and the publishers.

The book has a special interest to the Naturalists' Society, for much of the material was collected within the State of New South Wales during the last ten years. The problem of correlating the Australian dragonflies with their nearest relatives in other parts of the world has proved a fascinating one, and has inspired the author to carry out most varied researches on various difficult or obscure points in the biology of the dragonflies. Every chapter of the book bears the mark of the author's own personality, and frequently of his own research; whilst the 188 figures are practically all original, and are remarkable alike for their distinctive clearness and their accuracy in detail.

The work of other scientists is described and discussed, and many workers will be grateful for the bibliography containing references to over 200 pages and treatises of the most varied character. From its breadth of outlook the book is more than a biology of the dragonfly, and it is hoped that its appearance will prove a stimulus to intensive study of other families of insects. Although the volume is intended primarily for those who have had a biological training, many parts are of the greatest interest to any careful reader, who will take the trouble to study the text and the admirable drawings. A glossary of technical terms, with explanations and derivations, and an index of more than usual completeness, greatly enhance the value of the book.

The last chapter is worthy of being reproduced in separate cover, for the tips on collecting and rearing specimens are of the greatest value to all collectors of insects; whilst the section on biological methods includes concise instructions for making microscopic sections, both by single and double embedding, by methods which the author has found most useful in his own research. Much of Mr. Tillyard's work was begun in the scanty leisure afforded by a busy professional life; we can only hope that his *magnum opus* may inspire further systematic study of our Australian insect fauna before the advance of civilisation causes some of its most interesting individuals to be deleted.

—F.W.C.

BALANCE SHEET, YEAR ENDING JULY 31, 1917.

RECEIPTS.

	£	s.	d.	£	s.	d.
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,, Subscriptions				48	5	6
,, Interest, Savings Bank	2	14	4			
,, Interest, War Loan	2	5	0			
				4	19	4
				£185	0	0

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	£	s.	d.	£	s.	d.
By Printing Journal	23	16	0			
,, Printing Cards and Stationery	2	7	9			
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,, Petty Expenses				4	13	11
,, Balance, Savings Bank	78	17	10			
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				£185	0	0

Examined and found correct:—

N. HEWISON, } Hon. Auditors.
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Hon. Treasurer.

30th July, 1917.

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ERRATA.

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Page.

26. Line 13 from top, insert "in running water." Do., middle par., for "Manshell" read "Manwell."

30. For "Prescott" read "Pescott."

32. For "Deudy" read "Dendy."

115. 2nd line from bottom should be 15th from bottom.

134. For "tractiopod" read "brachiopod."

154. 6th from top, for "laval" read "larval."

192. Number of page should be 182.

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THE

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

2nd October, 1917.—Mr. W. W. Froggatt presiding, and about 30 present. Misses Winter, Somerville and Manning, Mrs. Fitz-John, and Mr. R. J. Nocross were elected members.

Miss Busby contributed a fine description of the Flora and Birds of Mount Penang, near Gosford, in a paper entitled "Jottings from the Bush." Mr. T. Steel, "Zoological Notes," and an account of an interesting experiment with the saltwater mosquito, *Culex vigilax*. Mr. W. W. Froggatt read a vivid account of an armed raid on a village in Papua, contributed by Mr. Murray, an entomologist, one of the officers of the Expeditionary Forces, and exhibited a collection of beautiful butterflies from Papua.

Mr. Froggatt also contributed a paper on the "Game Birds of the Lachlan River country, showing the vast numbers of quail and pelicans at present breeding on the river flats.

6th November, 1917.—Mr. E. S. Edwards, President, in the chair, and about 30 present.

Mr. E. Zeck read a paper, "Observations on a Myrmecophilous Histerid (*Chlamydopsis epipleura*, Lea.). Mr. A. A. Hamilton gave a lecture on "Shore-Line Vegetation," being Topographical, Ecological, and Taxonomic notes on the ocean shore-line vegetation of Port Jackson district.

4th December, 1917.—Mr. E. S. Edwards, M.A., President, in the chair, and about 40 present.

Mr. H. E. Finckh exhibited a flowering specimen of *Elodea densa*, a water weed. Mr. E. Zeck, a fine series of Buprestidae. Master White, a couple of lizards which he had completely domesticated. Mr. F. W. Carpenter delivered an address on "Photography as an Adjunct to Nature Study," having special bearing on entomology. Mr.

Carpenter was attentively listened to, his remarks being most instructive and interesting, and were accompanied by excellent slides.

The President intimated that, following our usual custom, there would be no meeting in January.

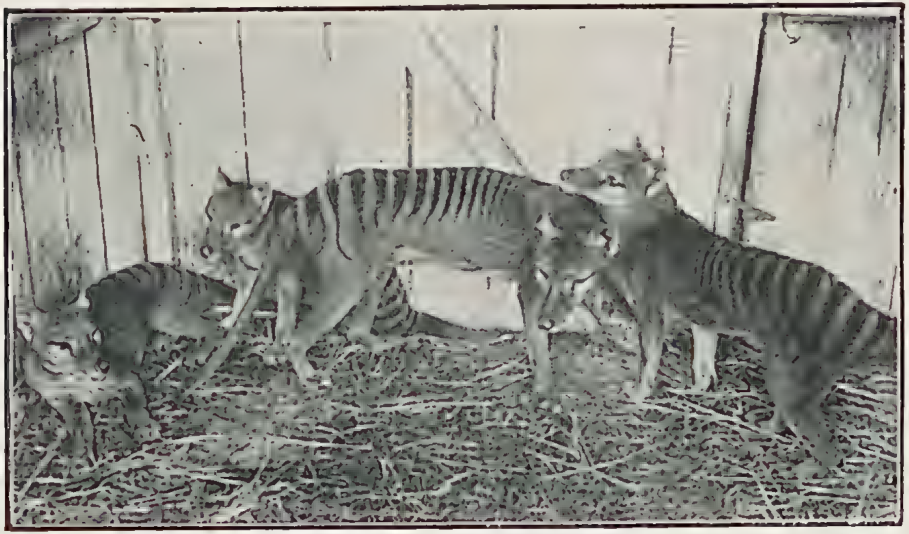
A VISIT TO A PRIVATE ZOO, "BEAUMARIS," HOBART.

(By Miss Isabel Busby.)

Plate I.

One of the things to which the writer looked forward with pleasure when contemplating a visit to the lovely little Tasmanian capital, was to seeing the very interesting collection of birds and animals at "Beaumaris," and to making the acquaintance of Mrs. H. L. Roberts, who probably enjoys the distinction of being the only lady in Australasia who owns a private Zoo. Mrs. Roberts is a Corresponding Member of the London Zoological Society, this honour having been conferred upon her some years ago for "eminent services rendered to the Society," so it was stated, in forwarding a collection of Australian animals, with which they were very pleased. A letter of introduction from a mutual friend in New South Wales paved the way for a call, and Mrs. Roberts kindly made an appointment for a private inspection, when she would be at leisure to show me all that was to be seen. First, a word as to "Beaumaris" itself, and how it came to be the home of so many animals and birds. The first thing that strikes one is, what an ideal place it is for them; quite handy to the heart of the city, and yet away from the noise and bustle, and visitors frequently admire what Mr. Dudley le Soüef called the "beautiful old English garden," which surrounds the equally English-looking house. Mrs. Roberts first bought some pheasants and jackasses, and finding them an attraction to visitors, she went on adding others, until at last the gardens were opened in aid of a charitable fete. This was in November, 1904, and the opening ceremony was performed by Lady Strickland. There was no intention originally to make such an extensive collection, as Mrs. Roberts says "it just growed, like Topsy." For some

Plate I.



The Only Family Ever Reared in Captivity.

Thylacinus Cynocephalus

("Tasmanian Tiger.")

years the collection was used altogether for the benefit of various charitable societies, exhibitions being held at intervals; latterly tourists have had the opportunity afforded them of seeing it on specified days.

The animals, of course, form the most important part of the collection, and it is interesting to see some that are rapidly becoming extinct, notably the Tasmanian Tiger, so-called, although it is really a marsupial wolf (*Thylacinus cynocephalus*). There were four fine specimens of this tiger — males and females — beautifully striped animals and looking in good condition. On the morning of my second visit, a photographer had called to take a photo. of them, which he only succeeded in doing after the expenditure of a good deal of time and patience, owing to their restlessness. Another animal which is becoming rare is the Tasmanian Devil (*Sarcophilus Satanicus*); of these Mrs. Roberts had seven. These animals, like the personage after whom they are named, are not so black as they are painted, and I think they should institute a suit for libel against the person who branded them with this name. There is nothing at all diabolical about them, so far as one can see; on the contrary, they seemed rather amiable little beasts, and cantered up and down their enclosure in a lively, playful fashion, occasionally poking their noses or paws through the bars as if they wanted to make friends with the visitors. The marsupials were well represented, from the tiny little opossum mouse up to the kangaroos. The former has been in Mrs. Roberts' possession for five years, and is a great pet. Evidently it has a sweet tooth, as it lives upon sponge cake, dates, and almonds. Amongst the opossums was a beautiful white one, so-called, although its fur is really a creamy, or light buff, shade; a black opossum was in the same pen, and in the adjoining pen was a happy family, consisting of a pair of black opossums and their young one. This pair was presented to Mrs. Roberts by Lady Barron, wife of the ex-Governor of Tasmania, who took a great interest in the Zoo. Baby Possie was a fine little creature, and it munched away at a piece of bread held between its two front paws, whilst hanging to the wires upside down, apparently just as comfortable in an inverted position as an upright one. Last year this pair reared two young ones, one being born in April and one in September. The wallabies are represented by the Tasmanian varieties—Bennett's Wallaby and the

Rufous-necked. Of the kangaroos there were five, not counting a baby one still in the pouch. It, however, was big enough to sit up and take notice, and its pretty little brown head could be seen looking out quite contentedly as its mother hopped about the enclosure.

In a pen by itself was an African Meerkat, which was shortly to be sent over to New South Wales to Lady Cullen as a pet for her young daughter. A pair of meerkats a different variety was in another pen, and close adjoining a pair of American squirrels; there were also two pairs of Tasmanian flying squirrels, both pairs having young ones, and three wombats. These animals are becoming rare in the more settled parts, such as Cradle Mt. Two native cats, the black and white variety, and brown and white, a pair of baboons, and a small monkey are also included in the collection.

The bird section was the next to be visited, and here the writer's foot was on its native heath, so to speak, not because of possessing any scientific knowledge of them, but being a lover of the feathered tribe, they naturally appealed to her even more than the animals. Mrs. Roberts' collection of birds is really a very extensive one, but to write of them all in detail would take too much space, so I shall just mention a few that are of special interest and summarise the rest in conclusion. After the peacock, who spread his gorgeous fan for our admiration, perhaps the handsomest birds are the pheasants, of which Mrs. Roberts has quite a number, and it was hard to decide whether the golden pheasant, the Lady Amherst, or a hybrid (a cross between these two) should hold pride of place for beauty, while the silver and Mongolian pheasants had their own claims to distinction. The Lady Amherst has a curious tippet of speckled black and white feathers around her, or rather his, neck, and when the bird is displaying, these feathers look like a little umbrella. Mrs. Roberts has a very beautiful stuffed specimen of a Lady Amherst, in which the tippet is elevated in this way. Perhaps even more interesting than the pheasants are the herons, of which there are two—a Tasmanian blue-fronted heron and a white heron from the banks of the Murray River. This bird, which has been so ruthlessly destroyed in the breeding season for the sake of its plumes, is a melancholy example of the ''frightfulness'' of man where birds and animals are concerned.

Whilst looking at the birds, suddenly a familiar cackling laugh was heard, causing the visitor to remark, "That sounds like home," and a family of three "Jackies" was seen perched in a row. The baby kookaburra was reared in the aviary, and Mrs. Roberts stated that it remained five weeks and three days in the nest after she knew that it was hatched; on the day that it made its "debut" from the nest there was great jubilation on the part of the parent birds, who continued to feed it for some considerable time. Mrs. Roberts has also bred in her aviaries a number of Wonga pigeons, pheasants, Mandarin and other ducks, doves of various kinds, finches (including the rather delicate Gouldian), Californian quail, budgerigahs, and others. Recently her pair of brush turkeys built a fine mound, and she hoped to rear some of these interesting birds, but unfortunately the hen died through being egg-bound.

The parrot aviaries contain many birds of varied and brilliant plumage. Here can be seen the New Zealand kea—the bird that is over-fond of mutton and likes it alive, and its formidable-looking beak would make one believe all that is said of the kea's evil propensities; but this particular bird is very gentle and tractable in captivity, and is, in fact, rather a pet with Mrs. Roberts, on account of its many amusing little ways. She has had it for eight years, so presumably it is now cured of its *penchant* for mutton-fat. Other birds of the parrot tribe in the collection are:—

African Grey Parrot.
Crimson-winged Parrot.
Port Lincoln Parrot.
King Parrot.
Ring-necked Parrot.
Barrabands.
Red-rumped Parrots.
Golden-green Parrots.
Galahs.
Whistling Grass Parrakeets.
French Parrakeets.
Pennant's Parrakeets.
Moreton Bay Rosellas.
Adelaide Rosellas.
Swift Lorrikeet (now becoming rare in Tasmania)
Leadbeater's Cockatoo.

Cockatoo-Parrakeets.
Blue Bonnets.
Blue Fronted Amazon.
Mountain Parrot.

Of doves and pigeons there are:—

Wonga Wonga pigeons, N.S.W.
Crested Bronze Wings, N.S.W.
Common and Brush Wings, Tasmania.
Necklace Doves, Java.
Pink Eyed Doves, Q.
Peaceful Doves, Q.
Little Green Pigeons, Philippines and Australian.
Barred Shouldered Dove.
Barbary Doves, both varieties.
Blue-winged Dove.
Plumed Ground Dove.

Other birds are a pair of black swans, which swim in their stately fashion in a pond shaded by N.Z. flax and tree ferns, also Cape Barron geese, Maned geese, King teal (now almost extinct), Mandarin ducks, Mallard and Paradise ducks and a Mountain drake; a pair of emus, chestnut-faced owls, Tasmanian bald coot and native hens, the last-named being peculiar to Tasmania; also Spur-winged and Black-fronted plovers.

Two or three aviaries contain many small birds of different kinds—a Paradise whydah, graceful honey-eaters, finches of several varieties, Californian and King quail, a pair of New Guinea minahs or grackles, and georgeous plumaged weavers, now in colour and putting on airs accordingly. It is noticeable that the weavers are much more aggressive and overbearing towards the other birls when in colour than whey they are in their coats of sober brown.

Altogether, the collection is a most interesting one, and if any members of our Society are paying Hobart a visit at any time, they should not fail to call and see it.

NOTES ON AUSTRALIAN MYXIES (MYCETOZOA MYXOMYCETES).

(By Edwin Cheel.)

A group of minute organisms, which may be placed intermediate between the Animal and Vegetable Kingdoms, have been classified under various names, derived from the Greek language, such as Mycetozoa, Myxomycetes, Myxogastres, and Myxothallophyta. They are more commonly known as "Slime Fungus," while others have adopted a pet name and called them "Myxies."

They are characterised by the constant sequence of three main stages in their life-history, namely:—

(1) The firm-walled spore gives birth to a swarm-cell.
(2) The swarm-cells coalesce to form a wandering plasmodium.
(3) The plasmodium ultimately concentrates to form either sporangia, enclosing numerous spores (Endosporeae), or sporophores, bearing spores on their outer surface (Exosporae).

They appear to be an intermediate group of living organisms which, during the early or plasmodia-stage, somewhat resemble minute Amaebae, and when mature are very similar to fungi. Many species are quite common, and are found usually on the decaying bark of logs or on fallen branches in the deep gullies around Sydney, or on decaying leaves, bark, manure, or grass in gardens or parks. One of the most common species in this state is Physarum cinereum, which, during the months of December and January, attracts a good deal of attention throughout the State. It occurs usually in patches varying in size from one to five feet in diameter, and creeps over various kinds of plants, such as "Couch Grass (*Cynodon dactyl*on), "Buffalo Grass (*Stenotaphrum americanum*), "Flat-Weed" or "False Dandelion" (*Hypochaeris radicata*), and others. Another species which is fairly common is the so-called "Flowers of Tan" (*Fuligo septica*). This latter species does not occur, as a rule, in such large patches as *physarum cinereum,* but the plasmodia-stage, which is usually of a canary-yellow colour and somewhat resembles the yolk of an egg that has been squashed or broken, occasionally spreads to an alarming extent on tan-beds, in hot-houses, or frames. In some countries *Spumaria alba* shows itself in great masses, and sometimes proves indirectly injurious to plant-life, as its plasmodium often creeps up the stems of living plants and forms spore masses up to two or three inches in length and an inch or more wide. When produced in considerable quantities, the dense masses of spores are said to injure vegetation by a process of suffocation. It is on record that both *Physarum cinereum* and

Spumaria alba have spread to such an extent in meadowland that the grass mown for hay has been considerably lowered in value. [Th. Wulff in "Zeitschr. Pflanzenkr. xxiii., p. 2-5 (1908.)] These organisms are not regarded as parasitic in nature, and so far as can be ascertained, no active poison has been found to be present; but it is stated by Mr. George Massee (Diseases of Cultivated Plants, p. 533, 1910) that instances are on record that horses and other animals have suffered, or even died, from the effects of having eaten the masses of spores adhering to grass, etc. It is suggested that in such cases the injury is caused by the irritating action of the spores on the mucous membrane. A disease which occurs in crops of cabbage and turnips, and known as "Club-root" or "Finger-and-toe Disease," is caused by the species "*Plasmodiophora*" *brassicae*. Another species, *Spongospora subterranea* (*C. scabies* of some authors), also causes a disease in potatoes known as "Corky Scab." These two species are somewhat different in their mode of life to the three previous mentioned species, as they do not form fruiting bodies like those that are found on rotten wood, etc., but live in the cells of the host-plant, so that in these two instances we may regard them as parasitic in nature. Although usually placed among Fungi, they show great affinities with the lower forms of the animal kingdom, especially with the *Monadina* group. Other organisms which show close relationship, and in former times called "slime-mould," are those which cause malaria, which is said to live a part of its life in the body of the mosquito, and then transmitted to man; and also another, which causes Texas fever of cattle. These latter groups of organisms receive greater attention from the zoologist than from the botanist. The chief distinction between the Mycetoza and the fungi is that the vegetative body of the Mycetoza consists of naked protoplasm without a firm membrane, with no cellular mycelium, as in the true fungi. The spores germinate freely in water during warm weather, setting free a mass of plasma or swarm cells provided with a nucleus and vacuoles, which resembles amoeboid bodies. These soon acquire a flagellum at the anterior end, which aid in their movements in water. To a large extent the swarm-cells feed on bacteria, which are caught by pseudopodia projected from the posterior end of the body. The swarm-cells rapidly increase in number by bipartition. A few days after the germination of the spores, the process of bipartition, by which the number of the swarm-cells has greatly increased, ceases. The majority now withdraw the flagellum and adopt true amoeboid movements. These amoeboid bodies collect in clusters, and coalesce to form plasmodia, which may be described as masses of naked protoplasm abounding in nuclei, and more or less-coloured granules. As the plasmodium increases in bulk by the ingestion of nutritive matter, and by the union of small plasmodia, it acquires the remarkable streaming movement peculiar to itself. In the majority of cases the plasmodia is of a whitish colour, but there are many in which it is yellow, and in some it is greenish, pink, or purple. Only the other day (November 22nd) I received the plasmodia-stage of *Lycogala epidendrum* for the first time, although I have several specimens, collected when quite mature, from the Botanic Gardens, National Park, and from Russell Falls, in Tasmania. The plasmodium of the specimens of this species was found in sawdust at Scheyville. It was of a reddish or orange-red colour, tinged with yellow. When the plasmodium has exhausted the food supply it changes into the sporangia stage, which, in the course of their development, and also to the conditions of its surroundings, undergo a great change in colour, differing according to the species. In some cases the plasmodia stage continues for upwards of twelve months, in others they will go through the several stages from the germination of the spores to the formation of the sporangia in a fortnight. If the plasmodium is allowed to become dry, it passes into the sclerotium or resting stage. On being wetted the sclerotium will revive in the course of a few hours and resume the streaming movement. Preserved in a dry state, it is stated that certain species will retain their vitality for three or four years. The formation of the sporangium of some species is particularly interesting, as just prior to the bursting of the sporangia they are seen as whitish or ash-coloured patches; but when the spore case or sporangia have shed their spores, they are dark, or nearly black. When the sporangia are formed, a membranous or calcareous residuum or hypothallus is often left by the plasmodium, forming a base on which the sporangia are seated, as in the case of *Stemonites,* etc. In a number of species a beautiful net-work of threads are found, which is termed a capillitium. This is constructed before the spores are formed. The capillitium differs widely in structure in different genera, and is beautifully adapted to assist in the dispersion of the spores on their reaching maturity. In *Stemonites* the capillitium springs from the columella (a stalk within the sporangium), and extends to the surface of the sporangium, where it forms an enclosing net; the delicate membrane covering the meshes shrivels up on ripening, so that the spores lie in an openwork basket, and are blown by the wind through the openings. Carbonate of lime is abundant in the plasmodium and young sporangia of some species, and the term lime-knots is used. It has been suggested that these lime-knots contain formic and acetic acids, so that it is possible that this may be injurious to animals if eaten in sufficient quantity.

Some of the species of Mycetozoa are remarkably cosmopolitan, a large number of species being found with identically the same characters in different parts of the world. Forty-eight species have been recorded for New South Wales, which are representative in 24 genera and 11 families, as follow:—

MYCETOZOA (Myxomycetes).

Family CERATIOMYXACEÆ.

CERATIOMYXA fruticulosa Macbr.

Family PHYSARACEÆ.

BADHAMIA utricularis Berk.

PHYSARUM dictyospermum Lister.
viride Pers.
viride var incanum Lister.
flavicomum Berk. Sydney District.
nutans Pers.
nutans var leucophæum Lister. Common about Sydney.
cinereum Pers. Common throughout the State, especially Port Jackson District.
gyrosum Rost. Rare, Sydney Bot. Gardens.
sinuosum Weinm. Sydney District.
bitectum Lister.

FULIGO septica Gmelin. (*F. varians* Somm.). "Flowers of Tan." Common in all parts of State.

LEOCARPUS fragilis Rost.

DIDERMA effusum Morg.
radiatum Lister.

COLLODERMA oculatum G. Lister.

DIACHÆA leucopoda Rost. Bot. Gardens, Sydney. common.

Family DIDYMIACEÆ.

DIDYMIUM difforme Duby.
nigripes Fries. var xanthopus. Bot. Gardens, Sydney.
squamulosum Fries.
leoninum Berk. et Br.

MUCILAGO spongiosa Morg. (*Spumaria alba. D.C.*).

Family STEMONITACEÆ.

STEMONITES fusca Roth. Sydney District.
splendens Rost. var Webberi List. National Park.
ferruginea Ehrenb. Parramatta.

COMATRICHA nigra Schrœt. (C. obtusata. Preuss). Port Jackson District.
typhoides Rost.
irregularis Rex.

Family HETERODERMACEÆ.

CLASTERODERMA debaryanum Blytt.

CRIBRARIA argillacea Pers.

DICTYDIUM cancellatum Macbr.

Family TUBULINACEÆ.

TUBIFERA ferruginosa Gmel.

Family RETICULARIACEÆ.

DICTYDIAETHALIUM plumbeum Rost.

Family LYCOGALACEÆ.

LYCOGALA epidendrum. National Park and Bot. Gardens, Sydney. Common.

Family TRICHIACEÆ.

TRICHIA verrucosa Berk.
affinis De Bary.
persimilis Karsten.
varia Pers.
decipieus Macbr.
erecta Rex.
botrytis Pers.
botrytis Pers. var cerifera.
botrytis Pers. var lateritia List

Family ARCYRIACEÆ.

HEMITRICHIA vesparium Macbr.
serpula Rost.

ARCYRIA. ferruginea Saut. Hill Top.
cinerea Pers.
œrstedtii Rost. (*A. fuliginea* Mass.)
incarnata Pers. Bot. Gardens, Sydney.
nutans Grev. Fairly common, Sydney.

PERICHÆNA corticalis Rost.

Family PLASMODIOPHORACEÆ.

PLASMODIOPHORA brassicæ Woron. In turnips, cabbage, and roots of other cruciferous plants.

SPONGOSPORA scabies (Berk.) Brunch. "Corky scab" of potatoes.

The classification given is that of the second edition of Mycetozoa, by A. Lister, revised by Miss G. Lister in 1911. See also Journ. Bot. (1915) 203, for other Australian and New Zealand records.

THE SALTWATER MOSQUITO.

(By Thos. Steel, F.L.S.)

In the *Australian Naturalist,* ii., 132, Miss Froggatt has a most interesting note on the capacity of the larvae of *Culex vigilax* to live and thrive in either fresh or salt water.

Having secured some of the larvae from the salt pools at Cronulla mentioned by Miss Froggatt, I kept them in an open-mouthed glass vessel covered with muslin; the water gradually evaporated until it was about one-third of its initial volume, when the last of the larvae died. The increasing salinity of the water seemed to stunt the growth of the larvae, which increased very little in size, and died one by one. The last one died in August, after being kept from February, 1917. At this stage the residual water had a Sp. Gr. 1.165, which is equivalent to a salinity of nearly 22 per cent. of salt. Sea water contains about 3½ per cent. of salts, so in above instance the larvae lived in a concentration of more than six times that of sea water. They appeared to feed on the green confervæ which grew in the water.

BOTANICAL NOTES.

EXCURSION TO HEATHCOTE.

There is an association of plants on the banks of the Woronora River at Heathcote such as may be found in the gullies on the lower slopes of the Blue Mountains, many of which are confined to this sector of the Port Jackson district. In some of the species we have no evidence of connecting links between these localities, and it would be of interest if members would note any such occurrence which may come under their observation. The shapely *Grevillea asplenifolia* has elongated racemes of bright purplish-grey flowers (now in bud), and leaves with a silvery sheen on the hairy undersurface rivalling that of the famous "Silver Leaves" of Table Mountain, *Leucodendron argentea.* This species, which does not ascend the Blue Mountains beyond Lawson, reaches the Woronora via the Nepean and Georges Rivers, travelling along the river banks, its customary habitat. This handsome shrub is exceptionally adaptable, and is easily grown in the sandy soil of the Port Jackson district. (See note in this journal for April, 1914.) *Conospermum tenuifolium,* a plant with lilac-coloured flowers and grass-like foliage, which forms matted tufts on the shady banks of the stream, descends from the higher altitudes on the Blue Mountains to the neighbourhood of Lawson, and is not again found until it reappears in the vinicity of Heathcote. A few advanced bushes of *Pseudanthus pimelioides* already display clusters of fully-expanded flowers on the tips of the branches. The snow-white colour of the flowers, which are unisexual, is supplied by the sepals of the males (*perianth*), no petals being produced by either staminate or pistillate flowers. It was collected by Sieber at Linden in 1823, and is not known by the writer to occur between Linden and the "Woronora." One of the "Needlebushes," *Hakea propinqua,* whose large tuberculate fruits provide a useful guide to the species, is common in swamps on the higher elevations on the Blue Mountains, and descends to Linden. It reappears on the coast south of the Hawkesbury, following the coastal standstone (it is not found on the Wianamatta Shale) to the northern side of Port Jackson, at Killara, where it was recently collected by Miss M. Le Plastrier. It is found in several places in the National Park. The flowers of the Blue Mountain plants are yellow, those of plants growing in the coastal area retaining the customary white petals. *Phebalium diosmeum,* a low shrub with heath-like foliage and terminal clusters of yellow flowers, is sparsely represented at the base of the gullies. This is the nearest locality to Sydney known to the writer where this species can be collected. *Pomaderris ledifolia,* discovered by Allan Cunningham at the Cox River, is also found in the neighbourhood of Springwood. It is a small-leaved, rather harsh shrub, and does not wander far from the river banks. *Bertya pomaderrioides,* a slender, shade-loving plant, is occasional among the taller shrubs near the water. It is common in Erskine Creek and other watercourses emptying into the "Nepean" south of Emu Plains. *Hibbertia acicularis* and *Bossiæa rhombifolia,* neither of which approach very closely to Sydney, are here plentiful. The "Mountain Moss," *Lycopodium densum,* is also found on the hillsides at Heathcote. —A. A. HAMILTON.

REVIEW.

MIGRATIONS OF FISH.—This is the title of a work by Professor Alexander Meek, M.Sc., of Armstrong College, in the University of Durham. Professor Meek is also Director of the Dove Marine Laboratory at Cullercoats, a little to the north of the entrance of the River Tyne, in England. Professor Meek is an ardent worker in the cause of fisheries investigation, and science. The fine modern laboratory over which he presides was visited by me during the course of my fisheries investigations in England in 1915, when Professor Meek was busily engaged in the preparation of his work, which now sees the light in a handsome volume published by Edward Arnold, in which the author deals with practically the whole gamut of questions relating to the migrations and, incidentally, the spawning of the various kinds of fishes. As the author points out, it has been recognised, although somewhat tardily, that an adequate knowledge of the migrations of fish is necessary before measures are taken, or regulations are framed, to preserve and extend the harvest of the waters. During the last two decades especially, the problems of migration have been investigated with gradually increasing energy, and the result has been an accumulation of valuable knowledge.

In his work, Professor Meek has done a great service to Fisheries Science by his elaborate treatment of the knowledge that he has collated.

In his chapter on the migrations of Salmon and Trout, the author touches upon a subject which is of great interest to Australian students, and that *is* as to the variation and migration in the Pacific *Salmonidæ.*

The "*everlasting*" *Eel* naturally receives from the author very considerable attention.

Sea currents are, as we well know in Australia, importantly associated with fish migrations, but there are other hydrographical considerations also to be considered. The study of the surface life in oceanic waters is also inseparably associated with investigations relating to the migrations of food fishes. What has been done in other parts of the world must, in the ordinary course of events, be carried out in Australia if we are to get that information which will be essential to a permanent knowledge and regulation of our sea fisheries.

Professor Meek's work is a fine example of the printer's art, and is accompanied by 11 plates and 128 text figures, illustrating fishes, ocean currents, etc.

Every field naturalist ought to endeavour to acquire a copy of this very useful work.

"The Migrations of Fish," Meek, 1916 (London, Edward Arnold), pp. viii., 427, Pl. xi., Fig. 128.

—D.G.S.

NOTES AND COMMENTS.

GOMPHOCARPUS FRUCTICOSUS and DANAIS.—Mr. Larcombe contributes the following note:—When living at Trangie, planted the Bladder Bush (*G. fructicosus*) in the school garden. It grew and flowered, when it was first visited by *Danais petila,* the small brown butterfly, and later on by *D. menippe,* the Brown Gipsy or Monarch, an introduced insect which has spread from America through the Pacific Islands and Australia, and in our coastal districts, when in the larval state, feeds upon the foliage of this plant. The Brown Gipsy laid her eggs on the Bladder Bush, but these were destroyed by plant bugs.

ZOOLOGICAL NOTES.—On a recent visit to Auckland, N.Z., I visited a "Zoo" at Royal Oak, where there is a fair collection of animals. Lions seem to do particularly well, as I saw three very healthy-looking families of cubs. There were what struck me as some rather odd associations. A large monkey was rearing two fox-terrier pups, and it was amusing to see the unceremonious manner in which the monkey grabbed the paws of a pup with its feet and searched amongst the pup's hair in the manner characteristic of monkeys.

One cage contained white rabbits and pigeons, whilst in another were two monkeys and a young pig. The pig was very active, and kept following the monkeys about in order to secure anything thrown to the latter which they failed to catch. The monkeys took no notice of the pig.

On the ferry steamers on Auckland Harbour I was struck with the extreme tameness of the sparrows, which hopped about all over the decks whilst the steamers were *en route*, picking up crumbs close to passengers' feet.

—THOS. STEEL.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

5th February, 1918.—Mr. E. S. Edwards (President) in the chair, and 45 present.

Miss Felstead and Mr. Stevenson were duly elected members.

Mr. W. W. Froggatt exhibited and read a note on Nardoo," *Marsilea drummondi.* Mr. E. Cheel, on behalf of Miss le Plastrier, a fungus, *Battaria phalloides.* Mr. Cheel also contributed interesting details of his observations on the Cup Moth in connection with the secretion of manna on the leaves of *Eucalyptus.* Mr. L. Gallard showed and read notes on the Yellow-Winged Tipula, also *Thilotheca,* a fossil in sandstone, from near Gosford, usually found only in shale. Mr. H. E. Finckh, a live Mexican Salamandar (*Ascolete*), with observations on its life-history. Mr. W. W. Froggatt delivered a very instructive lecture on "Flies."

5th March, 1918.—Mr. W. W. Froggatt (Vice-President) in the chair, and about 26 present. An apology from the President was read.

Mr. H. E. Finckh exhibited a flowering plant of the Water Hyacinth, which is so great a pest on the Northern Rivers; and Mr. A. G. Hamilton described the means being used for getting rid of it. Mr. A. G. Hamilton, a flowering specimen of *Clematis,* with one of its leaves coloured purple on one half. Miss Steinbeck, a collection of Composites gathered alongside the Trans-Continental Railway, including the beautiful pink *Acrodineum roseum.* Mr. T. Steel contributed a bird note, also one on "Ecdysis of Spider" (*Isopoda*), and exhibited with extracts, a couple of interesting old manuscript books.

Mr. Froggatt read, on behalf of Mr. Keith McKeown, "Notes on the Carpenter Bee," and on behalf of Mr. H.

A. Milligan, a note on "Development of the Emperor Gum Moth." Mr. A. A. Hamilton contributed notes on the "Adventituous Aerial Roots of Cycadaceae."

It was unanimously decided to hold a "Working Bee" on Friday evening, 12th April, to arrange and catalogue the valuable collection of books in the Society's Library.

NOTES ON MICRODON, A SYRPHID FLY.

(By L. Gallard.)

The specimens of Microdon larvæ, exhibited at the meeting in March, 1917, were found in February in the nest of a small black ant in the decayed bark of an ironbark tree at Epping. The mature larva is crescent shaped, about five-sixteenths of an inch in length and three-sixteenths wide. The ventral surface is flat, and the organism resembles a flattened Dacylopid scale more than the larva of a fly. The body is white, and is covered with a fine network pattern; the margin is fluted like the edge of a coin. On the dorsal surface near the posterior end is a hard, horny stigma or spiracle, about one-sixteenth of an inch in length. As the larva develops, two horny processes grow up through skin at the anterior end, like a pair of horns. These I take to be the sheaths of the long elbowed antennæ of the adult fly, and it also appears to be by these that the pupal skin is broken at the time of emergence. When the larva is at rest the head is drawn in so as not to be visible, but when in motion, the tiny head can be seen protruding from under the front margin. The head, in a preserved specimen, is seen to be telescopic, and capable of being drawn back into the body at about where the third segment would be. It appears to have the ordinary mouth organs of a fly larva, terminating in a pair of hardened styles. When ready to pupate, the larva turns brown and the outer skin hardens, but the shape does not alter.

The adult is a longish fly, somewhat resembling a wasp in shape. The colour is dark brown, with old gold markings. The abdomen consists of three visible segments marked off by two bands of golden pubescence, and is attached to the thorax by a long flat pedicle. It has a long telescopic ovipositor.

The antennae constitute the most striking feature. The two basal joints are closely adpressed, and appear to form a pedicle from which the flattened terminal lobes project, but on inserting a pin between them they open ~~out~~ into two flat-sided joints. The terminal lobes are clothed with an arista close to the base. I kept a number of the larvæ in a jar with some of the associated ants, but could not observe any attention on the part of the latter. I am of the opinion that the larvæ feed on the eggs and larvæ of the ants, and that the ants may get in return a secretion from the fly larvæ.

SHORE-LINE VEGETATION OF PORT JACKSON DISTRICT.

(By A. A. Hamilton.)

(Abstract.)

The various agencies affecting the vegetation on the ocean shore-line were dealt with, showing that the factor most injurious to plant life in this region is the on-shore wind, which compresses the shrubs into a stunted horizontal growth, and sets up an unstable condition for the beach and dune plants by eroding and transporting the loose sand. The plants adopt various devices to secure a foothold in the mobile soil by trailing, deep tap-rooting, forming a carpet, or by framing a network of underground stems.

Two indigenous grasses, *Spinifex hirsutus* and *Festuca littoralis,* play an important part in the building and upkeep of the exposed dune embankment, the Fescue performing the office of pioneer builder and the Spinifex retaining the sand collected by its hardier associate, which ventures out on the beach beyond the limit of other vegetation.

The fruits of the beach plants are specially equipped for sea voyaging, their coats consisting of woody, corky, or pithy material, primarily designed for buoyancy, and of a tough but yielding texture capable of resisting fracture if dashed by the waves against the rocks, when travelling, by means of the ocean currents from beach to beach.

The lecture was supported by some admirable photographs of the dunes, taken by Mr. Carpenter.

OBSERVATIONS ON A MYRMECOPHILOUS HISTERID.

(*Chlamydopsis epipleuralis, Lea.*)

(By E. H. Zeck.)

Plate ii.

On turning over a stone at Como on the 10th June, 1917, beneath which was a nest of small black ants (*Iridomyrmex gracilis*, Lowne), the first thing I noticed was one of the ants running towards one of the tunnel openings with a small yellowish object in its mandibles. I immediately caught the ant to see what it was carrying, and found that it was one of the light-coloured *Histeridae* (*Chlamydopsis epipleuralis*), that frequent the nests of this species of ant (Fig. 1 and 2, Plate ii.).

These were kept alive in a glass tube, and observations were made extending over a period of six days; but were only noted for about half an hour each evening.

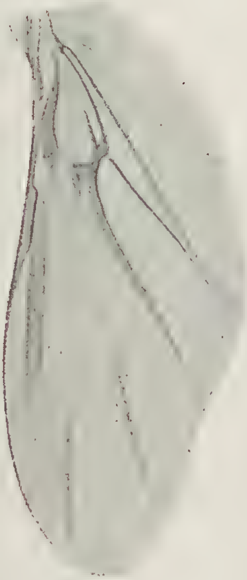
The nest in which this beetle was found contained two others which were resting with their legs and antennae contracted.

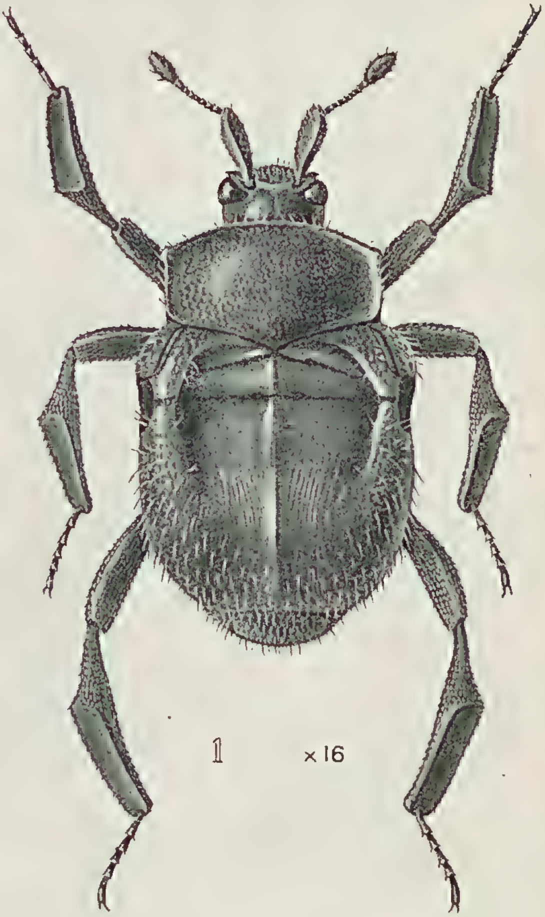
After two days some ant larvae (about six in number, which had been collected from the same nest, but kept alive in a separate tube), were introduced into the tube containing the beetle and the ant. These larvae the ant promptly killed and ate, leaving only their skins, showing not the slightest concern that they were its own relations.

One evening the ant was seen cleaning or licking the beetle on the dorsal (upper) surface, and then washing down each leg, afterwards washing the head and antennae. Having finished, the ant seized the beetle by the raised process on the left elytron, but, seeming undecided what to do next, placed it down again, and seizing one of the beetle's outspread forelegs with its mandibles, turned the beetle over on to its back and then cleaned the whole of the ventral (lower) surface. After this the beetle was turned back again. During the whole of the time this washing process was going on the beetle had its legs and antennae spread out, and had I jarred the tube it would immediately have contracted them. Having turned the

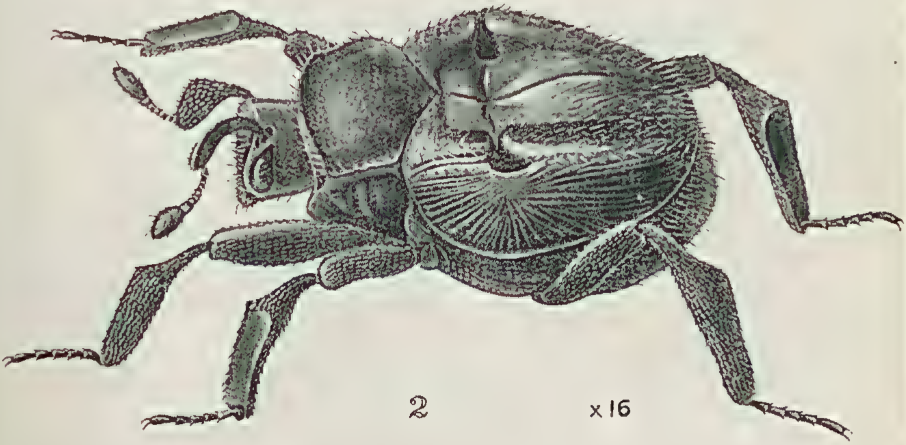
PLATE II.

3 × 16





1 × 16



2 × 16

E.H. Zeck. del.

beetle back, the ant picked it up in its mandibles, seizing it, as before, by one of the raised processes on the elytra, and carried it to the other end of the tube, where it deposited it. The ant then commenced to clean its own legs and antennae.

About ten minutes later the ant again began to clean the beetle on the dorsal surface, gently moving it about with its front legs whilst licking it.

Another day the ant did not seem to be certain which end of the tube the beetle should be left at, as it was continually carrying it to and fro.

The following evening the ant seemed determined to have the beetle remain at one end of the tube. If the beetle walked back of its own accord the ant would immediately carry it back to where it had started from.

Whilst the beetle was being carried it contracted its legs, and did not during the whole of these proceedings attempt to escape from the ant.

Description of Plate.—Figs. 1 and 2., *Chlamydopsis epipleuralis,* Lea. Fig. 3, hind wing of *C. epipleuralis.* As far as I know, this beetle has not been previously figured, but was described in the proceedings of the Royal Society of Victoria, 1912, by Mr. A. M. Lea.

NOTES ON THE HABITS OF (*LESTIS BOMBYLANS*), THE CARPENTER BEE OF THE GRASS-TREES.

(By Keith McKeown).

In view of the fact that very little has been published regarding the habits and life-history of the Carpenter Bee of the Grass-trees (*Lestis bombylans*), it is thought that the following notes made during a visit to Joadja Creek, N.S.W., may prove of interest.

The Carpenter Bees make their nests in the dead and dry flower stalks of the Grass-trees (*Xanthorrhoea*) by hollowing out the pith to a depth of up to 12 or more inches. The bee commences operations by boring a circular hole, about 3½ lines in diameter, towards the centre of the flower stem, where it abruptly turns upwards or downwards, following the soft pith. Early in the season (November) the marks of the bee's mandibles in the first work of excavating this tunnel may be plainly seen roughly marking out the future entrance. Once in the soft pith, the work of excavating proceeds rapidly. The vertical tunnel usually extends both above and below the entrance hole, and is about half an inch in diameter. In the excavation of this shaft, the bee bites off pieces of pith with her powerful mandibles, and then by means of the forelegs, conveys these particles, together with wood dust, to the hairy ventral surface of the abdomen, the finer dust being collected on the large brushes of the hind legs. When fully loaded, the bee climbs up to the exit, and protruding her abdomen through the hole, proceeds to clean off the wood-particles with the first and second pairs of legs, working backward with a raking movement; then the hind legs are extended, and the collected wood dust removed by rubbing one leg against the other.

When the tunnel is completed the next work is that of provisioning the first cell. A coarse yellow pollen is collected on the brushes of the hind legs and is conveyed to the nest. I believe this pollen is that of the Grass-tree itself, though I have, unfortunately, been unable to verify this. The pollen is packed on the floor of the cell, and when sufficient has been collected, the bee works it up with the addition of honey into a spherical loaf of sweet-smelling bee-bread, of a rich, dark yellow colour, and slightly sticky to the touch. The egg is then laid on the ball of bee bread, and the next operation is that of constructing a roof to the cell by means of a plug of wood fragments, bitten off from the walls. The plug is constructed in concentric circles, one inside the other, until only a small aperture is left, which is finally closed with wood pulp. This partition, while forming the roof of one cell, is also the floor of that next above.

The cells are not usually constructed in any regular order; one or two cells may be built in the section of the nest below the entrance, and then, perhaps, one in the portion above. The cells measure about half an inch in depth.

I have never observed a nest in which the space near the entrance hole is filled with cells; it is always left vacant for about an inch or more on either side. The largest nests I have examined contained eight or nine cells.

The method of defence of the nest is curious. Upon an intruder attempting to force an entrance, the bee places the armoured dorsal surface of the abdomen against the entrance hole, which it completely fills, at the same time bracing its legs against the walls of the tunnel, making it practically impossible—without using considerable force—to displace the bee and gain access to the nest. Should an enemy enter the nest while the bee is at some distance from the entrance, she places herself across the passage and obstructs it in the same manner. While protecting the nest, the bee buzzes loudly and shrilly, and at the same time emits a very sweet honey-like scent. While at work during the day the bee frequently comes to the entrance, apparently to survey the weather conditions, and bees may frequently be seen resting with their heads out of the entrance hole. At night the entrance to each nest is closed by the armoured back of the occupant, and it is a curious sight to see a nest closed in this manner by its living door. Although provided with a very formidable-looking sting, I have never seen the bee attempt to use it.

The larva on emerging from the egg grows rapidly, each stage of growth appearing to be proportionate with the consumption of the food—i.e., when the larva is half-grown the ball of bee-bread is about half consumed. When feeding, the larva moves its head with a sweeping movement, the mandibles cutting away fragments of the bee-bread. When the food supply is entirely consumed, the larva remains almost motionless for several days before changing into the pupal stage. When full-grown, the larva is smooth, and of a clear white, with the eyes slightly tinted with brown; it is legless, and tapers toward both extremities. Length, from 7 to 10 lines.

The pupa is about 5-6 lines in length, of a beautiful clear white and almost semi-transparent, looking almost like a delicate Chinese carving. Each limb is enclosed in a separate sheath of the pupal skin, and not bound to the body. After a few days the eyes of the pupa become brown, and before the imago emerges, the colour of the pupa becomes a dull bronze. The pupa also acquires the power of movement, and is able to use the legs strongly. Specimens placed in empty nests a few days before emerging climbed up and down the shaft without apparent inconvenience, and could also travel some distance when placed on a flat surface providing a firm foothold.

The method of escape of Carpenter Bees from the nest has been a subject of considerable discussion, opinions differing as to the manner in which this is accomplished. The end cell in the nest, i.e., that farthest from the exit, is finished first, and the enclosed bee is therefore the oldest, and should emerge before the others. How, then, does the bee in the cell farthest from the exit emerge without destroying its brothers and sisters still sleeping in an immature stage in the cells above? Or does it remain in the perfect state in its own cell until all the bees in the nest above it have emerged? The following is the method of *Lestis bombylans* as appears from my observations:—

By the time the first bee is ready to emerge, all the occupants of the cells above have changed to pupae—none are in the larval stage. The pupa at the bottom of the shaft, endowed with the power of movement referred to above, proceeds to break away the partition of the cell above him, the occupant of which falls down to the bottom of the shaft among the dust and wood-fragments from the destroyed partition, there being just room for the two pupae to pass in the tunnel. Pupa No. 1 then climbs up and attacks the next and subsequent partitions, and the pupae from the cells above fall down among the debris of the destroyed partitions at the bottom of the shaft. The first pupa having reached the clear space near the exit, after resting for a while, rubs off the pupal skin in a more or less fragmentary and frayed condition—that covering the eyes and antennae appearing to be the last removed. In a few hours, when the wings have expanded and dried, the perfect bee is ready to take flight. When the next and subsequent bees are ready to emerge, they simply work their way up through the wood fragments, etc., and escape from the pupal skin in the clear space. In a few cases the pupa worked its way to the top of the debris several days before divesting itself of its pupal skin. The perfect bees generally remain in the nest for several days before dispersing.

I have as yet been unable to ascertain the number of broods per season, but from the notes I have, it would appear probable that there is only one, as the dead flower stems of the Grass-tree soon fall.

The male bee is of a beautiful metallic green colour, face white, and the thorax and base of the abdomen clothed with golden hairs, those on the dorsal surface of the thorax forming two parallel bars. The wings are slightly clouded with brown. Length, over half inch.

The female bee is slightly larger and stouter in build than the male. The colouration is similar to the male, but lacking the golden down, the abdomen darker and with a purple shade. Its wings are dark brown and almost opaque.

The sexes appear on the average to be two male to three female bees. The cells containing male bees do not appear to differ in any way from those containing females, nor do they appear to occupy any definite position in the nests. No parasites were observed in any stage of the metamorphosis.

REFERENCES TO THE CARPENTER BEES.

Chas. Darwin: "The Descent of Man." Note the remarkable difference in the colouration of the male and female bees of the Genus *Lestes*.

W. W. Froggatt: "The Entomology of the Grass-tree." Pro. Linn. Soc., New South Wales, p. 81, 1896. "Notes on Life History."

W. W. Froggatt: "Australian Insects," 1907, Hymenoptera, p. 117.

F. Smith: "Notes on the Habits of Australian Hymenoptera," Trans. Ent. Soc., London, Vol. I. (Ser. 2), p. 179, 1850. Describes the nesting habits of these bees.

INTERESTING OLD MANUSCRIPT BOOKS.

(Exhibit by T. Steel.)

A couple of interesting old manuscript books, dated respectively 1790 and 1813, were written by Mr. Thomas Manwell, a remarkable self-educated man, who, by his unaided efforts, acquired a very high proficiency in Natural Science. The first book contains mainly extracts from different authors on the most varied subjects, from observations on Geology, Ethnology, Chemistry, and Mathematics, to "Reflections on Creation," from one of Dr. Blair's sermons. Some of the papers are extremely quaint. Thus, in an essay on "Generation of Plants and Animals," quoted from a letter by Dr. Burthogge, a Devonshire physician, to Mr. Locke, the old legend of the growth of eels from horse-hairs is told thus:—"Pluck a hair from a mare's tail and instantly, while quick with life, put it ing water—it will become a little animal; it will have a head (the only thing wanting, for the tail is already completed), and be a serpent in miniature. The experiment will be most effectual if the hair be plucked at a particular season. The little animal will then be most frisky and begin to move much sooner than if it were plucked in a less genial season. This experiment seems to confirm the doctrine of equivocal generation more than any other author has been able to do; yet, after all, it is very problematical."

So, evidently, worthy Dr. Burthogge had his doubts. One wonders if Mr. Manshell ever tried the experiment himself.

Here is another interesting quotation:—"An ingenious author's remarks on noxious animals.—It may be asked, whence arises the necessity of those noxious animals which we meet with in most parts of the globe? Would it not have been better if Providence had furnished it with harmless creatures adapted only to feed on the fruits of the earth, fit emblem of celestial innocence? To this may be answered that Providence is, in this instance, particularly wise. The earth was made in order to support the greatest number of animals possible: it is most consistent with the goodness of an all-wise Creator to give being to as many creatures as His earth would nourish. Were all animals, therefore, only to live upon the fruits and herbs of the field, they could not possibly subsist in such numbers as they now do, as there would not be a sufficient quantity of food to supply them. But as some live upon the fruit, and are food for others, which in turn are themselves a prey to the most rapacious of all, thus every chasm in nature is filled, and no vacant space is left in the page of universal beauty.''

Truly, this old author, whoever he is, reasons in a circle, reminding one of the devout rural clergyman who, when preaching on the beneficent designs of an all-wise Creator, instanced how beautifully Providence had arranged matters, by placing all the great rivers right alongside of the large towns and cities! Speaking of the properties of some food plants, some quaint remarks are made:—

''Potatoes are agreeable to hot and thin constitutions, but not proper for cold stomachs, or such as are very phlegmatic. In general, however, they are very nourishing food.''

''Lettuces of all sorts, both cool and open, and are therefore good after a debauch.''

''Apples are cool and loosening, and help the appetite; are best eaten raw in the morning; are good for the scurvy and spleen; are a most noble pectoral, and have cured some persons of a confirmed consumption.''

Amongst notes on meat foods occurs the following:—

''Venison, though a food which the scarcity and high value of it have rendered delicious to the palates of the luxurious, has nothing but the expense to render it preferable to good, tender English mutton, which is always more wholesome; besides, the nicest palates have been imposed upon by artful cooks, who have served up one for the other, without discovery, to their own private emolument.''

Here is an interesting statement which is new to me, and possibly others, and which might be submitted to observation by some of our members:—

''Quadrupeds that chew the cud have suet instead of the soft fat of other animals, and rise from a recumbent posture upon their hind legs first.''

The other volume deals entirely with questions of time, calendars, and astronomical data, and both are models of careful, patient work. The books are written in printed characters very neatly done.

Mr. Manwell died in 1822, aged 70, and was buried at Swanage, in Dorsetshire, England, where his tombstone still stands. He was an ancestor of Mr. F. W. Hixson, of Elizabeth Bay Point, to whose kindness I am indebted for the loan of the volumes.

THE ADVENTITIOUS AERIAL (APO-GEOTROPIC) ROOTS OF CYCADACEAE.

(By A. A. Hamilton.)

An interesting series of seedlings of *Macrozamia spiralis,* Mig. (*Zamia spiralis,* R.Br.), in which these structures were more or less developed, was recently collected at Ettalong Beach, Woy Woy, by Miss Hilda Butler. Aerial roots are not uncommon in this family, but as they arise in the seedling stage and do not remain long on the plants, only occasionally appearing above the ground line, their occurrence has not been frequently observed. Sachs, "A Text Book of Botany," in a figure illustrating the germination of *Macrozamia spiralis* (p. 437), depicts rudimentary structures, representing these roots on a seedling plant of this species. Marloth, "Flora of South Africa," figures (p. 99, pl. 15), a peculiar coral-like formation of such roots, ascending from the tap-root, a little below the crown of a seedling of *Encephalartos villosus,* Lehm. Discussing these coralliform roots, Marloth (p. 95) says:—"It is not certain what the function of these roots may be, but they probably assist in the nutrition of the plant, thus functionally corresponding to the mycorrhiza of some *Conifers* (*Pinus, Podocarpus*)." A peculiarity of these roots, according to Marloth, is that in a certain circular layer of their tissue they harbor masses of a green alga (*Nostoc punctiforme*). The habit of sheltering algae in aerial roots is also attributed to *Stangeria paradoxa,* Moore, another member of the Cycadaceae. Algal symbiosis, in the roots of Cycadaceae, was noted in the *Aust. Naturalist,* Vol. 2, p. 194, by Mr. W. M. Carne, one of our members who is now on active service.

NOTES ON PARASITIC WASPS.

(By L. Gallard.)

These notes were illustrated by exhibits of the specimens described.

Zeuzera.—The larval skin of a very large moth of this genus. Contained considerably over 100 parasitic wasp cocoons, so closely packed as to resemble a series of long honeycomb cells. So closely packed were the cocoons that the perfect shape of the host grub was retained. This specimen was found in the centre of a Blue Gum sapling near Gosford.

Cut-Worm "Bubong Moth."—In this case about 150 small wasps emerged. The caterpillar when taken from the ground retained its normal shape, but was quite flabby, so that it hung down on either side when laid across a stick. By the following morning all the wasps had emerged and arranged themselves around the caterpillar's skin, so that only the ends could be seen.

Papilio Aegeus.—From the pupa of this butterfly 175 black chalcid wasps emerged through a small hole in the side.

Brown Olive Scale (*Lecanium oleae*).—About three dozen parasitic wasps (*Scutellista cyanea*) were bred from this scale, taken from the Passion Vine at Eastwood in January, 1916. This wasp was introduced from California, about 17 years ago, as a parasite of the Brown Olive Scale. About two-thirds of the scale from Ryde and district were found to be parasiticised. The wasp can be readily identified by the very black colour, the hump-shaped back, and the peculiar V-shaped scutellum on the thorax. After devouring the inside of the scale the larvæ pupate in the dead shell, and duly emerge through the opening on top.

NOTES AND COMMENTS.

Game Birds on the Lachlan Riverina.—Mr. M. T. Little, Stock Inspector, Hay, reports:—I have just returned from a trip to Maude and Oxley, via Benduck, Canoon, and Thelangerin. The country looks well, and wild game is plentiful on the Lachlan especially. Quail, several species, including the large stubble quail, small button quail, and a quail with red feathers on the breast. Several good bags were made recently.

In parts of the Lachlan small fish (Carp) are in millions; the water is black with them; and great flocks of shags are following and eating them. The fish are concentrated in one large water-hole near Thelangerin homestead, and another near Corrong homestead; but they are followed by the shags, in spite of the fact that the latter are being constantly shot at and otherwise disturbed. The Carp seem to know that they are safer near the habitations of man. Among these Carp are many red ones. I understand these fish (Carp) are a plague on other useful fish, eating their eggs; but the cod and perch are also plentiful. On some of the lakes and swamps, ducks, swans, and other wild fowl generally, are in millions.

On one swamp near the Lachlan one man started recently to destroy the shags, as they are said to hunt the wild ducks. He and a mate started in the morning by killing all the young shags they could lay hands upon and smashing all the eggs. They worked hard until midday, when they were knocked up, and they had destroyed only a very small fraction of the young birds and eggs in the swamp.

ORCHIDS.—In the *Victorian Naturalist* for February and March there is a most interesting paper by Mr. E. E. Prescott, dealing with the reproduction of terrestrial orchids. Mr. Prescott shows that in the plants studied, notwithstanding the elaborate mechanical contrivances for ensuring cross-fertilisation, and although abundance of seed may be produced, it has never been shown that the seed will germinate, and reproduction seems to be entirely dependent on the growth of tubers on the roots. We commend the paper to the notice of our members.—Ed.

DEVELOPMENT OF *Antheraea eucalypti*.—The following interesting note, by Mr. H. A. Milligan, of the public school, New Lambton, was read at the March meeting. In December, 1916, five larvæ of the Emperor Gum Moth spun their cocoons. In February, 1917, one moth emerged. Up to December, 1917, there had been no further developments, so I cut open two cocoons. One chrysalis was dead, destroyed by a parasite, while the other appeared healthy. The two remaining cocoons were left, and on 20th February, 1918, a fine male moth emerged from one. The other I am keeping under observation. As fourteen months seems a long time for emergence, I am bringing the observation before the Society. About ·50 of the school boys made the observation along with me.

Mr. Froggatt supplies the following comment:—This is an interesting note, because, as a general rule, the caterpillars that pupate in December come out in the following February. We have had instances of their remaining over the second year, and Mr. Milligan's accurate record of long-delayed development is worth noting.

NARDOO (*Marsilea drummondi*).—At Hay, on the banks of the Murrumbidgee, after the floods of October last, a great many patches of Nardoo sprang up and grew luxuriantly.

In the olden days the seeds were gathered in large quantities, and Nardoo stones for grinding the seeds were common in the blacks' camps. This is the food upon which poor Wills, of Burke and Wills' expedition, tried to live when he reached Cooper's Creek.

W. W. FROGGATT.

BIRD NOTE.—An interesting observation by my friend, Mr. E. Booth, is worth recording. On 16th December, Mr. Booth noticed a young bird in his father's garden at Chatswood, which was perched on a branch, and being fed with worms and insects by three different birds. From Mr. Booth's description, which was quite clear, Mr. Bassett-Hull considers that the young bird was probably the Pallid Cuckoo (*Cuculus inornatus*), and that the birds feeding it were yellow-breasted Shrike Robin (*Eopsaltrina australis*), Silvereye (*Zosterops coerulescens*), and Sparrow (*Passer domesticus*). The young bird kept up its incessant characteristic cry, and drooping and shaking its wings, whilst the three foster birds were industriously searching for and bringing it food.—Editor.

ECDYSIS OF SPIDER (*Isopoda* Sp.).—This is one of the large brown spiders common under bark, about out-houses and in flat crevices generally, and popularly but erroneously called "Tarantula."

The spider spreads its legs out head upwards on a wall, and gradually withdrew the legs, followed by the thorax and abdomen. the carapace separated from the body, and the skin of the abdomen split longitudinally on the neutral surface, and was turned outside in by the withdrawal of the abdomen. It then turned head down, hanging close to the cast skin by the spinnarets, which also made an attachment to the wall. and so hung until sufficiently dried to move off.

When gently touched, the spider dropped a little way, hanging by a strong thread, still head downwards. The skin, which was quite perfect, remained adhering to the wall.

On several occasions at night I have noticed a spider belonging to above genus feeding on the hairy larva of *Darala ocellata*. The spider clung head downwards on a wall, holding the larva in its falces.

T. Steel.

Microdon.—In connection with Mr. Gallard's paper on this interesting insect, *see* a paper by Deudy, Victorian Naturalist, vi., 135, 1889.—Ed.

THE

Australian Naturalist.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

2nd April, 1918.—The President, Mr. E. S. Edwards, in the chair, and 22 present.

Miss E. Elliot was elected a member.

Mr. Shiress exhibited *Eucalyptus eximia, Trachymene clelandi,* and *Lasiopetalum macrophyllum,* collected between Hawkesbury River and Cowan. Mr. Froggatt contributed a note on "Intelligence in Parrots."

A paper, "Observations on Bees," by the Hon. Editor, Mr. T. Steel, was read, and highly appreciated.

Mr. D. G. Stead gave a most interesting lecture on "Trawling in Peace Time and War," illustrated with lantern slides, which gave his audience an insight into the wonderful work done by the trawlers at the present time, and made one proud to belong to the same race as the heroes of the North Sea.

A note by Mr. T. Steel was read on "Butterflies and Colour," and one by Mr. Froggatt on "Intelligence in Parrots."

7th May, 1918.—The President, Mr. E. S. Edwards, in the chair, and 30 present.

Master P. Murray exhibited a specially interesting collection of insects from the mountains of New Guinea, made during his vacations.

Mr. Froggatt, a highly-coloured Phasma, showing protective mimicry.

Mr. A. A. Hamilton, on behalf of Dr. Cleland, roots of "Lilli Pilli," showing bacterial nodules.

Miss Mabel Brewster read useful papers on the life-history of a parasitic ichneumon Wasp (*Ophion*), and of a Bombylid parasite of the Mason Wasp.

4th June, 1918.—Mr. E. S. Edwards (President) in the chair, and 40 present.

Miss Caldwell, Dr. J. B. Cleland, Messrs. A. P. Kemp, and T. P. Dodd, and Masters T. P. Dodd and R. G. Dodd, were elected members.

Mr. Shiress exhibited the following plants:—*Trochocarpa laurina, Drimys dipetala, casuarina distyla, Grevillea mucronulata, Bulbophyllum minutissimum, Alsophila Leichhardtiana,* collected at Conway's Creek at its junction with Berowra Creek, and mentioned having noted the following unusual birds in the vicinity:—Gray Bill Magpie (*Strepera versicolor*), Diamond Dove (*Geopelia cuneata*), Quail (*Turnix maculosa*).

Mr. H. G. Smith delivered a most interesting lecture on "Some Essential Oils from Australian Plants," illustrated by lantern slides and samples of oils from a variety of trees. The lecture was one of special economic value, apart from its scientific interest, throwing much light on the subject of the evolution of the Eucalypts.

EXHIBIT OF PARASITIC WASPS, MARCH, 1916.

(By L. Gallard.)

The exhibit consisted of four species of parasites of Longicorn Beetles, five of Weevils, and one of a Fruit Fly.

Longicorn Parasites.—No. 1. Two specimens of the large Megalyrid Wasp, *Megalyra Shuckardi,* a very formidable-looking insect. The body is stout, of a shiny black, relieved with white pubescence. The female is about an inch in length, and is provided with a triple ovipositor three to three and one-half inches long. In the centre, the actual ovipositor is a slender tube, protected by the double sheath. This species is parasitic on *Phoracantha* larvæ, which form deep burrows in the trees. The exceptionally long ovipositor enables the wasp to reach the host larva.

No. 2. A pair of *Megalyra fasciipennis.* This species is somewhat smaller than the former, has clouded spots on the wings, and carries the ovipositor curled over the back, instead of straight behind, as in *M. Shuckardi.*

Both species have similar habits, and are described in Froggatt's *Australian Insects.* Unlike many other species, they do not form a cocoon, but make a little cell in the host larval tunnel, by spinning a partition in front and behind, in which they develop as naked pupæ.

In 1904-5 I bred *M. fasciipennis* from pupæ taken from She Apple (*Angophora lanceolata*) and Red Mahogany (*Eucalyptus resinifera*) trees in April. On October 4th, 1905, I took one on the wing. In 1910 I took both species from the common Black Wattle (*A. decurrens*), and in September, 1915, I got two fine specimens of *M. Shuckardi* out of the same plant at Epping. When I split the piece off the tree the adult wasps fell to the ground, and did not attempt to fly, being apparently dazed by their sudden emergence to the light.

No. 3. *Syngaster lepidus*. A parasitic wasp of medium size, very common in sandstone country.

No. 4. An amber-coloured undermined species, of about the same size as No. 3.

Weevil Parasites.—No. 5. The striped *Pimpla*, with white-banded antennæ (*Mesostinus*, sp.), bred from the common Orange-borer (*Orthorrhinus cylindrirostris*).

No. 6. Another striped species, resembling the last, but having shorter elbowed antennæ, and the ovipositor shorter and turned upwards. Also bred from Orange-borer.

No. 7. A large orange-coloured wasp, about three-quarters of an inch in length, body fairly heavy, long antennæ and ovipositor, and clear wings. Bred from the short, stout weevil of the Bangalow palm. I watched these thrusting their ovipositors into the tunnels of this weevil, and on several occasions I have taken them dead, with the ovipositor caught in the tunnel.

No. 8. A small dark orange-coloured wasp, with large, prominent, dark eyes, and a round abdomen. Ovipositor medium, wings clear, antennæ fairly long.

No. 9. A small black metallic wasp, of the genus *Thaumasura*. Antennæ elbowed, head wide, eyes prominent. Thorax stout and long, abdomen flask-shaped, tapering to a point. The dorsal surface of abdomen highly metallic, and the wings with large smoky blotches. The last two species are also parasitic on *Euthyrrhinus meditabundus*.

No. 10. Fruit Fly parasite (*Opius Tryoni*). Bred from Fruit Fly larvæ from the berries of the White Ash (*Schizomeria ovata*), Narara, in 1911.

This is a small Braconid, with orange-coloured body and dark abdomen. Both ovipositor and antennæ are long compared with the body. They are fully described in Gurney's report on the work of the Insectarium, Narara, in 1909 and 1910. These are shown to illustrate the contrast between them and the large Megalyridæ. In breeding these insects, I have specially noticed their wonderful powers of endurance. I have kept them in the larval stage for over twelve months, when they have hatched out into perfect wasps.

LIFE HISTORY OF OPHION, AN ICHNEUMON.

(By Mabel N. Brewster.)

I have been able to observe the life-history of an interesting ichneumon attacking the cut-worm larva (*Plusia*) feeding on the leaves of *Wisteria*. The caterpillars seemed to be parasitised only in the early stages of their larval life, when they were about one-sixteenth of an inch in diameter and three-quarters of an inch in length. They move in a similar manner to the loopers, and if touched, either stretched stiffly out along the leaf surface or looped up and remained rigid.

The caterpillars are of a pale-green colour, and nearly always lay parallel to a vein, generally the midrib.

I noted the presence amongst the caterpillars of several curious white cocoons, about one-quarter of an inch long, with black markings, and that near each of these there lay the shrivelled skin of a young cut-worm caterpillar.

One morning, about 8 a.m., I noticed a caterpillar with the end of its body quite colourless, and on examining it with the lens, saw a parasitic wasp larva in the act of emerging from its victim. The colourless portion was the head end, and the maggot was making its exit by the anal orifice of the caterpillar. By turning and twisting its body in a half circle the wasp maggot, which was green in colour, extricated itself from the remains of its host. At 8.25 p.m. the maggot was quite free, and crawled about a quarter of an inch away. It was now shorter and thicker than before. It then fastened itself at each end by a series of rope-like threads, and by moving its head backwards and forwards, proceeded to spin a cocoon of coarse threads. At 9 a.m. next morning the head was curved under the body, moving backward and forward, and at 11 a.m. it lay quite still.

There were thin patches on the cocoon where the threads were not so densely woven, and as the pupa became black on hardening, the dark surface showing through the thin spots of the white cocoon gave the mottled appearance which had already been noted.

The mature ichneumon escapes by cutting a hole at the end of the cocoon. The wasp hatched out in a fortnight. Cocoons appeared from March to May, being most plentiful in April.

The caterpillars which escaped being parasitised in their early stages were not subsequently attacked; a dozen which I kept under observation all pupated in due course.

A PARASITE OF EUMENES, A MASON WASP.

(By Mabel N. Brewster.)

The mud cells of the wasp were completed towards the end of November, 1917. Several adults hatched out in December, and one early in January. Two of the cells each contained a dark cylindrical cocoon, which was kept under observation, and in March, 1918, an adult Bombylid fly hatched out.

The mud cells had been broken, so the wasps had no difficulty in escaping. The pupal shell was seen to have a set of strong spines at the apex and two large stout ones on each side, the whole making a formidable weapon adapted for cutting a way out of the mud cell. The back is armed with rows of short vertical bars, having a short stout spine at each end. These are probably to enable the pupa to move along as it emerges. Between each bar of spines on the back is a very long orange-coloured hair, thus forming rows of hairs. The pupal shell had the top row of hairs attached to a number of loose threads on the outside of the dark cocoon. The body tapers at the anal end to form a little stout spiny cylinder. The pupa shows the wing pads, legs, etc.

The adult is a Bombylid or Bee Fly. David Sharp thus describes how Fabre discovered the habits of a Bombylid Fly (*Argyromoeba*), which laid its eggs on the mud cells of a Mason Wasp:—

"It entered the cell as a tiny slender worm, through a minute orifice or crack, but it is now much increased in size, and exit for a creature of its organisation is not possible. For some months it remains a quiescent larva in the cell of the bee, but in spring of the succeeding year it undergoes another metamorphosis, and appears as a pupa, provided with formidable apparatus for breaking down the masonry by which it is imprisoned. The head is large, and is covered in front with six hard spines, to be used in striking and piercing the masonry. When the hole is made in the mud cell the adult escapes from the puparium."

PLANTS BEARING ROOT NODULES.

(By A. A. Hamilton.)

In a review of the symbiotic association occurring in certain groups of plants, Mr. W. M. Carne (one of our members now on active service in Palestine) published a list in this journal (Vol. 2, p. 192) of Australian Legumes with bacteria-bearing nodules, and mentioned (p. 193) several families other than Leguminosæ, in which these nodules occur. Dr. J. B. Cleland, Principal Microbiologist to the Board of Health, recently secured an example of the "Lilli Pilli," *Eugenia Smithii*, showing these nodules. The family Myrtaceæ, to which the *Eugenia* belongs, is not mentioned in Mr. Carne's list, and Dr. Cleland's specimen provides an additional record of this occurrence in Australian plants. An interesting note on this subject by Dr. Thos. L. Bancroft, communicated by Mr. J. H. Maiden, Government Botanist of New South Wales, was published in the Proc. Linn. Scy., N.S.W., in 1893, Vol. 8, p. 51, and illustrated by a series of figures. Dr. Bancroft's note includes several Australian genera of the Fam. Leguminosæ, which are additions to Mr. Carne's list, viz., *Desmodium, Sesbania,* and *Crotalaria,* and two exotic genera, *Mimosa* and *Medicago.* Dr. Bancroft incidentally remarks (p. 52) that, so far as he was aware, his record was the first that had been made in Australia of root diseases of bacterial origin.

OBSERVATIONS ON BEES.

(By T. Steel, F.L.S.)

Some months ago there appeared in the columns of one of the Sydney morning newspapers some correspondence on the effects of the blossoms of the garden poppy on bees. One correspondent in particular stated that these blossoms had a deleterious effect on bees, causing their death a few hours after visiting the blossoms, the inference being that either the pollen or the nectar of the poppy contained something of a nature poisonous to the bee. He described his having caught a number of bees on poppy blossoms and confined them in cages, and, as a control, confined other bees captured just as they left the hives. He stated that the bees captured on the poppy blossoms all died within a few hours, and that those taken from the hive did not.

Being interested in the subject, I made, during the past spring and summer, a large number of observations. I caught bees in poppy blossoms, also those visiting a number of other plants, such as sweet peas, roses, dahlias, larkspur, etc., also pumpkins and the common rib-herb (*Plantago lanceolata*). As a control, a number of bees were captured on the ledge of a bee-hive just as they were leaving the hive in the morning, and therefore before they had visited any flowers. These were confined in some cases under a large glass bell-jar, and in others, in a roomy cage made of a butterfly net. In every case the bees, including those taken as they left the hive, died after a few hours' confinement, some within a couple of hours, others at varying times, up to seven or eight hours. I also noticed that bees entering a house and flying to the windows, on which they remained crawling, all died within the same limits of time. In most cases the bees were captured about 7.30 a.m., by which time some had their pollen sacks partly filled, while others appeared to be gathering honey only, and had no pollen.

The result was always the same, and the time of death was quite independent of whether the bees were pollen laden or otherwise. When first placed in confinement, the bees are lively and active, but gradually one after another becomes sluggish, until finally they crawl feebly about, then remain stationary, making slight movements of limbs and wings, until they curl up their legs and die.

Bees roll about most energetically in poppy blossoms, apparently revelling in the supply of pollen, and are easily caught by shutting blossom and inmates in a tin box. In pumpkin blossoms they are readily captured by gently closing the mouth of the blossom with the fingers. Bees visiting such plants as sweet peas, larkspur, plantago, etc., where honey is the objective, are much more alert, and require a net for capture. In the poppy and other highly polleniferous blossoms, the bees seemingly become so intent on the work of pollen collection as to be somewhat oblivious to danger.

I have experimented as above with a large number of bees from the different blossoms mentioned and from the hive, at seasons when poppies were and were not in blossom, and always with the same result. It appears to me that worker bees are intolerent of confinement away from the hive, and that they quickly fret to death. We know that in observation hives they can be confined without ill effects, but when kept away from the hive in confinement, my experience is that they quickly die. It is interesting to note that bees which have been overtaken by darkness at a distance from the hive, will camp under leaves and such-like, and return first thing in the morning with their spoils of nectar or pollen. Evidently, therefore, the fact of confinement seems to have a disastrous effect on the nervous system of the bee.

It would thus appear, in so far as my observations go, that there is no evidence that the poppy blossom has a deleterious effect on the bee. I cannot explain the statement of the gentleman above-mentioned, to the effect that bees taken from the hive did not die when confined, as my experience with a large number was uniformly to the contrary.

Early in April I made some observations on bees which I found in the evening camped in cosmos blossoms. Thirteen bees were collected, and, with the blossoms, placed under a bell-jar. In the morning three bees were dead, and the remainder displayed varying degrees of activity. The lot were then placed in the sun in open air. All the living bees at once began to liven up and brush their heads and bodies, and within a few minutes one after another flew away in the direction of the hives. After about twenty minutes, nine had flown and one remained; this one, though left in the sun, died in a few hours. Thus nine flew off and four died.

Next evening another lot of twelve were taken on cosmos blossoms as before, placed under bell-jar, and kept under observation. In the morning one was dead and the others more or less lively. By noon, half of the bees were very lively, making repeated attempts to fly away; one more was dead, and the remainder sluggish. At 2 p.m. four more had died, two were sluggish, and four fairly lively. After another two hours one was still lively and trying to fly off, five sluggish, and a total of six dead. By next morning four had died, while the remaining two were fairly lively. These were placed in the sun, but died during the day.

From this it appears that bees captured while camping out in the evening, are much more tolerant of confinement than those taken while at work amongst the flowers or leaving the hive for their collecting grounds.

NOTES AND COMMENTS.

Butterflies and Colour.—At Pennant Hills on the 24th March, I noticed an interesting case of colour attraction for a butterfly. A lady was standing talking to two other people on the footpath opposite my house. She was wearing a plain brown straw hat, fixed with a hat-pin, having a light-blue porcelain knob about half an inch in diameter. A butterfly, *Papilio sarpedon,* kept flying about the knob as if fascinated, and followed the lady closely when she went up the footpath to the house, only flying away when the lady entered the house. I watched it for quite five minutes, during which time the butterfly never went more than a few inches from the lady's head, and always returned to the blue knob, apparently trying to alight thereon. The lady several times brushed at the insect with her hand to drive it away. —T. STEEL.

PROTECTIVE MIMICRY.—At the meeting on 7th May, Mr. Froggatt exhibited a small Leaf Insect, apparently an immature specimen of the Thorny Phasma (*Extatosoma tiaratum*), sent by Mr. W. G. Foster, Public School, Rolland's Plains. This one differs from the typical forms in being much more brilliantly coloured—like grey and green moss—and very spiny. It is an excellent example of protective mimicry in a defenceless insect which feeds on moss and lichen-covered tree trunks. It had wandered on to the wall of a house, when captured, and even then its protective colouration was very striking.

INTELLIGENCE IN PARROTS.—Mr. Froggatt read the following note at the April meeting:—At a recent meeting of the Linnean Society of London, Miss Nina F. Layard, F.L.S., read her paper, "Wooden Scratching Tools Made by an African Parrot," illustrating it by specimens and lantern slides. She observed that it is often urged that a very long period of experiment was necessary before man finally produced anything so advanced as a Palæolithic flint tool, and even weapons of an earlier culture are not considered sufficiently vague in intention to fit the low intellectual capacity attributed to his earliest representatives. If it should come to be recognised that in the dumb creation there are instances not only of tool-users, but of tool-makers, valuable hints may be obtained as to the possible capabilities of the human tool-maker in the initial stages of his art.

Notes have been taken by the author of the behaviour of a Grey African Parrot, first in choosing out natural tools, such as pointed seeds and quills, for use as poll-scratchers, later in pointing up a match for the same purpose, and finally shaping up wood in such a way as to appear to warrant the bird's claim to be described as a tool-maker.

The contention is that if it can be proved that the Parrot, requiring an implement that would penetrate the feathers to the scalp, purposely produced a point with this object, then the border-line between the mere tool-user and the tool-maker has been crossed.

Mr. Froggatt contributes notes as follow:—In regard to the intelligence of Cockatoos and Parrots, this is a very interesting note to Field Naturalists. It is more remarkable for a bird to make a scratching tool than to build some of the wonderful nests which they construct. In the Brewarrina district my attention was often called to large patches of bark being nibbled off the stems of White Gums by the Galah Parrots below the openings to their nests. Bushmen declare that the bird does this the keep the Monitor "Gohanna" Lizard getting a foothold when trying to rob the nest, which it could readily do if the bark remained.

MISTAKEN BUTTERFLIES.—In *Nature,* Vol. 95, there are a number of most interesting communications on Butterflies mistaking various brightly-coloured objects for flowers, and attempting to feed thereon.

Prof. E. E. Barnard, of Yerke's Observatory, Wisconsin, U.S.A., relates seeing a butterfly (not named) alighting on a peacock's feather, which a man had in his hat, and attempting to find food in the "eye" of the feather.

Prof. H. O. Forbes describes seeing a species of Pieridæ, *Appias nero,* in Sumatra, deceived by brown withered leaves, to which the butterfly itself bears a close resemblance, and endeavouring to associate with them, thinking they were fellow-butterflies. This incident is fully described in Forbes' *"A Naturalist's Wanderings,"* p. 130.

Prof. G. H. Bryan says: "In this connection the case should be recalled of the Cleopatra butterfly of southern France and Italy, the close relative of our English Brimstone. By waving a grass-green butterfly net in its vicinity I have frequently attracted the yellow-and-orange coloured males, which will flutter after the net and endeavour to settle on it. The female is similarly coloured to the female Brimstone, but is rather larger. A blue net fails to attract them."

A highly-interesting incident is related by Mr. E. A. Martin, of the Grange Wood Museum, South Norwood:—

"A few summers ago I noticed a fine Cabbage Butterfly executing a number of gyrations in front of a milliner's shop in New Bond Street, and making every effort to get through the plate-glass window. Immediately inside the window was a lady's hat, ornamented by an enormous artificial scarlet poppy. It was quite clear that the object of the butterfly's attention was the poppy. Apparently he was guided by sight, and not by smell."—Ed.

Dragon-Fly Larvae in Brackish Water.—In connection with the power of aquatic larvæ, normally living in fresh water, to adapt themselves to existence in water which is more or less saline, the following interesting note from Mr. Tillyard's recently-published work, "The Biology of Dragon-Flies," may be profitably considered as a sequel to Miss Froggatt's paper on "The Saltwater Mosquito," *Aust. Nat.*, II., 132, and that by T. Steel, IV., 12.

On page 332 of his excellent book, Mr. Tillyard says:—

"Dragon-flies are known to breed in coastal lagoons, where the water is brackish. Osburn, by a series of experiments, showed that the larvæ could withstand a salinity up to a density of 1.01 (sea-water 1.026). At that point the larvæ could live, but could not undergo metamorphosis. At a density of 1.015 the larvæ suffered greatly, and soon died. The dragon-flies known to inhabit brackish water are (as might be expected) certain species of *Libellulinae, Anax,* and some *Agrioninae,* to which we may add, in Australia, a few species of *Austrolestes.*"

In the case of the Saltwater Mosquito, *Culex vigilax,* Steel found that as the water increased in salinity the larvæ remained for months without any appreciable increase in size, and died one by one, but were able to exist up to a Sp. Gr. of 1.165, equivalent to more than six times the salinity of sea water, or roughly, nearly 22 per cent. of salt.

The optimum density for dragon-fly larvæ found by Osborn, 1.01, is equivalent to about 1½ per cent. of salt, or less than half that of sea-water, which contains 3½ per cent. It is thus seen that the mosquito larvæ are infinitely more tolerant of saline conditions than are those of the dragon-flies.

—Thos. Steel.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

2nd July, 1918.—The President, Mr. E. S. Edwards, in the chair.

Mr. A. S. le Soüef delivered an instructive lecture, entitled "A Naturalist in South Africa." The lecture was an account of a trip from Mombassa to Victoria, Nyanza, and Uganda, and was illustrated by a most interesting series of lantern slides.

A paper, "Notes on Orchids," by Mr. Hugh Dixson, F.R.H.S., was read by the Hon. Editor. The paper was illustrated by a very fine series of orchid blooms from Mr. Dixson's orchid houses. These were explained by Mr. A. A. Hamilton and Mr. A. G. Hamilton, and examined with much interest by those present. The specimens exhibited comprised beautiful examples of *Cattleya*, Sp., *C. Schroderae alba, Coelogyne pandurata, Cyprepedium Leeanum, C. Spencerianum, Vanda Luzonica, Zygopetalum Mackai, Dendrobium aureum, Angraceum eburneum,* and *A. sesquipedale.* The last-named, with its extraordinarily long nectar tube, is the classic species referred to in the paper in connection with Charles Darwin.

The opportunity of seeing and handling so fine a display of orchids was much appreciated by the members, and a cordial vote of thanks to Mr. Dixson was carried by acclamation. Mr. T. Steel read a paper, "Egg-Carrying by Birds," and a note on Bees.

NOTES ON ORCHIDS.

By Hugh Dixson, F.R.H.S.

The orchids constitute a most fascinating group of plants. Even our small native species are charming, while our rock-lily, with its graceful sprays of fragrant flowers, is an ornament to any garden. And yet it is far less beautiful than many of the exotic species which in our climate require to be grown under glass, or even some which in the Sydney district flourish well in the open air.

Nowhere among plants, not even among the lilies, are to be found a more charming variety and purity of colouring. The loveliest of whites, reds, yellows, browns, mauves, golds, and blues are to be found, and are often contrasted in the same flower.

The shapes of the flowers of orchids are as varied as their colours, and while probably the greater proportion have no perfume, in many it is delightful. In an odd one the odour is not pleasant; one that I have smells like medicinal rhubarb.

Yet to my mind these plants have still more fascinating qualities.

Many years ago I read Darwin's work describing their mode and organs of fertilisation, and was so struck by what I read that I determined to grow orchids, and I have never regretted my decision. The mode and organs of fertilisation are utterly different to those of other plants. In a state of nature, there is no fertilisation by wind; this work must be carried out by insect agency. A bee, a butterfly, a moth or beetle, which, in search of nectar or the edible part of the flower, incidentally lifts the lid of a little case in which are enclosed the pollen masses attached to a Y-shaped pedicel. The lid springs up, and the pedicel, to which the pollen masses are attached, adheres to the insect like pitch. When the insect carrying the pollen masses visits the next flower, these are pressed against the sticky surface of the stigma, which the insect is compelled to pass, and to which the pollen masses adhere, and so the flower is fertilised. In most orchids the flowers, when not fertilised, will remain open for a long time, some for as long as three weeks; if fertilised, they droop within twenty-four hours.

It has been recorded that a butterfly has been found so weighted with the tiny pedicels on its proboscis as to be unable to fly; it must have visited over a hundred flowers.

Many of the flowers are so constructed that the visiting insect must take a fixed route to obtain the nectar, so that it has to back out, and in doing so, raise the lid of the pollen case. When Darwin saw the flower of the Madagascar orchid, *Angraecum sesquipedale,* with its nectary tube eleven inches in length, he declared that a moth with a proboscis of corresponding length must exist, and in due course such a one was discovered.

The little terrestrial orchids we gather in the bush will generally ripen their seed in a few weeks. The fine varieties grown in green-houses take from four to twelve months. The seed is very minute, even in large orchids—just a fine dust. When magnified, the appearance is not unlike that of small pods containing single peas. In the larger forms, when the seed-husk is magnified to an apparent length of half an inch, the seed itself will appear about the size of a pinhead.

Owing to non-fertilisation, much of the contents of the seed vessels frequently consists of seedless husks or shells.

There are other curious points about orchids besides the mode of fertilisation. There is, for instance, the production of an enormous number of seeds, and the very small proportion of these that germinate, probably not one in a million, in a state of nature.

The small Terrestrial Orchids may have nearly all their flowers fertilised; the larger varieties will have very few, and of the few, only a small proportion of pods reach ripeness. Very seldom is a pod approaching ripeness seen on our native rock-lily, *Dendrobium speciosum.* I don't think I have seen half a dozen, and those were in my own gardens, where they are relatively protected. A pod on some of the Vandas and some of the Cattleyas will contain a tablespoonful of seed.

If the fertile seed of orchids were all to grow, few though the pods are, in a few years there would not be room on the earth for other plants.

Most of the ladies know the Lady Slipper orchids (*Cypripedium*), of which there are a large number of varieties. It has never been recorded that a seed-pod has been found on a plant in a state of nature. Yet some must have seeded, as the same variety is found in widely-apart districts. It was for a plant of this order that it was said £1,000 would be given. A plant had been found among others in a consignment to England. When it flowered, it was found not to be in itself a beautfiul flower, but by hybridising other varieties, it added an additional beauty. The home of the plant has been found, and lately plants were sold for 3/- each at auction in London.

It is not generally known there are quite a large number of beautiful orchids that can be grown outside in the vicinity of Sydney. A rockery, sheltered from the south and cold winds, and by a tree from fierce hot sun, would grow several. As fine a *Cypripedium insigne,* a favourite, as ever I saw was grown on a rockery in a Double Bay garden. All the epiphytal species prefer trees. I have quite a number so grown. In a small, unheated glass-house a number of varieties can be grown, and quite as easily as other plants. A few hints would be necessary. The principal ones are, they must have good drainage, not to be over-watered, and except deciduous varieties in winter, never allowed to get bone-dry. The potting material, a mixture of stag-horn root fibre and broken crocks, is about the best now available; a little fine sphagnum moss mixed in in some cases is an advantage.

MYRMECOPHILOUS INSECTS.

THEIR COLLECTION AND OBSERVATION IN THE FIELD.

By E. H. Zeck.

It is at the request of the Editor of the *Australian Naturalist,* Mr. Steel, that I have written the following detailed notes on the collection of ants'-nest insects,.

On arrival at the collecting ground the first thing done is to search about for stones, both large and small, beneath which there seems the likelihood of ants being present. Having found a likely one, it is then turned over, and if any ants are present, the species is noted and the nest examined. To do this properly one has to kneel or recline at the side of the nest. A large nest, that is, one about a foot or more across, cannot be examined in a few seconds, as many of the beetles, such as *Chlamydopsis, Kershawia,* etc., often do not move for some minutes, and unless they move, it is almost impossible to detect them amongst the debris in the nest. Silverfish (*Thysanura*), crickets (*Orthoptera*), the Staphylinid beetle *Conosoma,* and the small blind beetles *Rodwayia,* seem to be constantly moving.

It may be as well to mention here that nests situated beneath stones nearly always have the tunnels or galleries, some of which are very large, running parallel to the base of the stone, the stone forming the roof of the nest. These galleries are, during the winter months, more or less filled with larvae and pupae. It is in the open portions, or at the sides of these galleries, that the insects are usually found, though in many cases the beetles will be found clinging to the stone in the part which was formerly the roof of a gallery.

When an insect is seen, it is easily picked up with a dead grass stem dipped in methylated spirit, or with a small brush, most of these small forms being too delicate to handle with forceps. Beetles taken in separate nests should be kept in separate tubes along with their host ants.

This method is good for specimens that are to be carded on the return home, but if observations are to be made, they should be placed alive into a small glass tube along with several of the ants, and some larvae and pupae. Many things can then be seen with the aid of a lens, such as their mode of walking, movements of the antennae, or how they contract their legs when alarmed, etc.

As regards the nests of large and pugnacious species of ants, to which Mr. Steel has referred, I may say that, to examine their nests during the summer months would be almost an impossibility.

It is during the winter months that the majority of the ants'-nest insects are to be found, and more especially after rain. It may be that the rain drives them to the top of the nest, by flooding the lower galleries, or perhaps they are following the larvae and pupae, which the ants have already carried to the top galleries.

I have not yet dug out any nests, but to do this successfully the whole of the dug-up material would have to be passed through sieves. The nests of the "bulldog ants" (*Myrmecia*) can be examined with comparative safety during the winter, the cold and damp seeming to stupify the ants; but few of these nests are to be found under stones.

Very little is found with the ants during the hot summer months, though I have taken *Tmesiphorus, Batrisodes,* and *Eupines.*

Not every nest contains an insect, though from recent collecting, it seems that every species of ants'-nest is worthy of examination. It is quite possible to search for days and find nothing but ants. In the end, patience has its reward, and, if at first you don't succeed, search, search, and search again.

EXHIBIT OF WASP COCOONS, JUNE, 1917.

By L. Gallard.

This cluster of cocoons was taken from the tunnel of a large wood-boring moth in an ironbark tree at Beecroft, about the middle of May. About the same time I got two similar clusters from a Blue Gum which some men were splitting for firewood. One was broken by the splitting, but the other was intact. In the broken cluster several nearly fully-developed wasps were exposed. In the unbroken cluster I estimate that there are between 75 and 100 pupae, which I take to be Pimplas. The adult measures about one and a half inches from head to tip of ovipositor. I got a number of other larvae, which I take to be the same species, in a moth-grub tunnel in *Acacia longifolia.*

A fine pupa of *Megalyra Shuckardi,* exhibited, is from the tunnel of a beetle, *Phoracantha,* in *A. decurrens,* and shows the extraordinarily long ovipositor rolled twice round the body. There is also shown a small beetle, *Stigmodera,* cut out of a gall on *Poltenia.* These galls are often an inch in length and three-eighths of an inch deep. The woody tissue is about a quarter of an inch in thickness, and no trace exists of a passage to the outside. The little beetle has, therefore, when mature, to eat its way through this barrier, and no small feat for such a little creature.

A NATURALIST IN SOUTH AFRICA.

By A. S. le Souëf.

The journey was from Mombassa, through to the Victoria Nyanza, and Uganda.

I was struck by the paucity of the native flora, as seen from the railway. Only two species of Acacia and one Juniper were noticeable, though there were dense thickets of Australian trees, principally *Eucalyptus globulus* and *Acacia decurrens,* which had been planted alongside of the railway line for miles, to supply fuel for the locomotives, because of the scarcity of coal. The growth which these trees have made is surprising. I saw wattles larger than any which I have met with in Australia. The eucalypts had a different character to those growing in Australia, being taller in proportion to girth, and even those planted in the open made no attempt to spread.

Nearly all the railway stations are planted with *E. radiata,* while the capital, Nairobi, has miles of these trees bordering its principal roads, and the main avenue through the town has a double row on each side of *E. calophylla rosea,* which were in full flower, making a finer show than anything I have seen in Australia, except perhaps the King's Park, in Perth.

The animals of South Africa are indeed wonderful in numbers and variety. One passes in the train through thousands of game, right up to the suburbs of Nairobi, comprising antelope of many kinds, giraffe, zebra, gnu, gazelle, ostrich, secretary vulture, crowned crane, etc. While on the Government farm at Navaiska I noted actually on the property lions, cheeta, spotted hyaena, several bush buck, impala, water buck, Thompson's gazelle, hippopotamus, baboon, green monkey, porcupine, ant bear, fox, jackall, wart hog, vulture, marabou, and the beautiful crowned crane was numerous; the pretty glossy starling and the brilliant little sunbirds were always in evidence.

On a journey up to the Aberdaire Mountains a large herd of elephants was passed. These animals, especially in Uganda, and at the present time, are destructive to the native crops. It was interesting to note where the leopards had placed the body of a small antelope, about fourteen feet up a small tree, for safety. The leopards play about in clear places in the forest like cats, tearing up the ground and springing far up the trees. Near a small creek indications of a rhinoceros at play were visible; small bushes torn up, and clods of earth thrown about, and a general wreck made of everything within a small area. In this district, too, I saw the beautiful Colobus monkey, which, in spite of its striking black and white colouring, was difficult to notice amongst the juniper trees with long lichen hanging to the branches.

Although in British East Africa very few insects were seen, in Uganda they were very numerous, especially lepidoptera, and here I met the famous driver ant, which was trekking through the town of Entebbe in millions.

EGG-CARRYING BY BIRDS.

By Thos. Steel, F.L.S.

The manner in which certain cuckoos manage to convey their eggs and deposit them in the nests of small birds, in which it is obvious the eggs cannot be laid in the ordinary way, because of the size of the cuckoo relative to the nest, has been a matter of speculation for many years. Accounts of observations on the subject have been published from time to time, and so far as I have noticed, it seems to be generally conceded that the bird lays the egg on the ground, then grasps it in its bill, and so conveys it to the foster-nest.

It has always seemed to me a most difficult feat for a bird with a bill shaped like that of the cuckoo to carry an egg in this manner without either crushing it or allowing it to slip out of its bill.

Some observations which I have made on the domestic fowl suggest a method of conveyance at once safer and more convenient.

If one watches a hen gathering scattered eggs into a nest it will be seen that she pulls them to her by means of her lower bill, gently pressing the egg against her breast, and thus lifting it into the nest.

In my poultry run, which was a small paddock, in which were bushes and logs, a hen had made a nest alongside one of the logs. I removed some of the eggs and placed them on the ground on the other side of the log, which was about 10 inches or a foot in height. Later I noticed that the hen had shifted the eggs back to the nest. I again removed the eggs, and stood near-by and watched the hen. She went up to the eggs, and with great care lifted one at a time by pressing the egg against her breast by means of her chin, hopped easily over the log, and put the egg back in the nest, returning immediately for the others, which were lifted in the same manner. As I was standing quite close to the hen, which was a very tame one, I could see the whole process of transfer quite plainly. I have thought it possible that a similar plan may be adopted by the cuckoo.

NOTES AND COMMENTS.

CHLAMYDOPSIS EPIPLEURALIS, Lea:—*Aust. Nat.*, Vol. IV., pt. 2, pl. II.—Owing to the blocks of this drawing not being reduced sufficiently in size, the magnifications stated thereof, x 16, are unfortunately incorrect. The correct magnifications now are x 19. The actual length of the beetle is 2¾ m.m. —E. H. ZECK.

THE WAR AND ZOOLOGICAL GARDENS.—The following extract from a letter recently received from London will interest Naturalists:—"Professor Hill has been several times at the "Zoo" lately seeing what animals can be dispensed with, and they are to be replaced by milk-cows, hens, ducks, rabbits, etc., all of use in this country in times such as these, and the keepers are to take charge of them. It seems such a pity to kill off the animals in the 'Zoo.' "

SHRIMPS FROM THE SKY.—The following paragraph appeared recently in the "Sydney Morning Herald":—"A recent report stated that a large quantity of shrimps fell near Singleton in a prolonged shower of rain. The Chief Secretary, the Minister controlling the State Fisheries, advises that steps were immediately taken to secure specimens of these shrimps, which have now come to hand, and are pronounced by the ichthyologist at the Australian Museum to be the freshwater shrimp, *Xiphocaris compressa.* These crustaceans are found in great abundance in fresh water throughout our river systems, and the shrimps which fell with the rain near Singleton were doubtless collected by a waterspout from some shallow inland lagoon or waterhole, and carried in the clouds to Broke, where the phenomenal shower fell. It will be of interest to recall the fact that at the end of 1913 a shower of small fish, identified as *Craterocephalus fluviatilis,* commonly known as hardyheads, fell in a rainstorm at Quirindi.''

HEIGHT AND GROWTH OF TREES.—In Vol. 46, 1914, of *Trans. New Zealand Inst.,* there is a most able paper by Mr. T. F. Cheeseman on ''The Age and Growth of the Kauri,'' in which a very clear description is given of the necessary precautions to be taken in making observations on the age of trees and their rate of growth. The paper also contains remarks on great trees of various parts of the world, including Australia.

The *Victorian Naturalist,* Vol. 35, p. 46, contains an extremely interesting paper by Mr. A. D. Hardy, on ''The Tall Trees of Australia,'' dealing in a comprehensive manner with the somewhat conflicting evidence of different observers on this subject. We commend these papers to the notice of our readers. —EDITOR.

NOTE ON BEES.—The *Mackay Mercury* has an interesting paragraph on the behaviour of bees attracted by the sugar damaged during the great cyclone some months ago:—''At the different mills where the sugar sheds were demolished, and the sugar melted by the rain, thousands of bees are to be seen feeding on the juice formed by the melted sugar or taking it from the damaged bags. They are found in swarms about the damaged sugar, busily collecting their loads, and moving back and forward between the hives and the sheds. At one of the mills a swarm has made its home in a super-heater (a kind of closed iron boiler) that is lying disused near the sugar shed. A hole about half an inch in diameter gives access to the inside of the super-heater, and the bees can be seen entering and leaving in a very busy manner throughout the day. Some difficulty will be experienced in robbing the hive should anyone decide to do so later on.''

On the same subject, the *North Queensland Register* says:—''The roof being off the store at Settlement, Hull River, bags of sugar were soon converted into syrup, which attracted swarms of bees, and for days over-indulgence in heady nectar seemed to be borne without disorderly effect, as if the spicy offerings of the tea-trees had seasoned the whole community. But as time passed, many became bloated, and being tipsy, passed from the stage of excited good-humour to almost helpless pugnacity. Unable to fly, they crawled and rolled on the ground, savagely attacking all bare-footed trespassers, illustrating the fact that industrious and provident bees fall from grace under the temptation of a super-abundance of stimulating sustenance.”

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ANNUAL MEETING.

30th August, 1918.—The formal business of the Annual Meeting was disposed of before 8 o'clock, at which hour His Excellency Sir Walter Davidson, G.C.M.G., and Lady Davidson, attended by Captain Saltmarshe, arrived. They were met by the President and Mrs. E. S. Edwards, Mr. F. W. Carpenter, President-elect, and Mr. G. A. Waterhouse, Acting Hon. Secretary. The President introduced the visitors to the other members of Council. After His Excellency had taken the chair, the Annual Report was read *pro forma,* after which the President delivered his address on "The Naturalist in Relation to Modern Science." At its conclusion, His Excellency thanked the President for his able and interesting address. He said that he was not a Naturalist in the strict sense of the word, but that was due to his indifferent eyesight. He was, however, keenly interested in all the world of nature around him. He would never forget his rambles with his children in the forests of Newfoundland. He felt the value of an intimate knowledge of natural objects, and deeply appreciated the poetic side of the Naturalist's outlook. Mr. W. W. Froggatt then moved, and Mr. F. W. Carpenter seconded, a vote of thanks to Mr. Edwards for his address. The motion was cordially carried. Mr. Edwards thanked the meeting, and introduced Mr. F. W. Carpenter, M.A., the new President, referring at the same time to that gentleman's active association with the Society's work and his brilliant academic career. Mr. Carpenter returned thanks for the honour conferred on him.

The Governor and Lady Davidson and other members of the audience then proceeded to examine the exhibits, of which a very fine display had been arranged by the members. So interested were the visitors in these that the meeting did not disperse until a late hour.

The following were the exhibits:—

Dr. R. J. Tillyard exhibited, by invitation of the Council, a large case of Dragonflies (Order Odonata), collected within fifty miles of Sydney, and totalling nearly fifty species. These ranged from the gigantic *Petalura,* with a wing-expanse ranging up to five inches, to the tiny *Agriocnemis hyacinthus* and *Ischnura aurora,* two brightly-coloured little gems, with an expanse of only about three-quarters of an inch. The Sydney district is particularly rich in groups that are peculiar to Australia, such as, for instance, the *Synthemini, Cordulephyini,* and the genera *Synlestes* and *Austroaeschna.*

Mr. G. A. Waterhouse's exhibit comprised a long and extensive series of the butterfly *Tisiphone abeona,* Don., from Southern Queensland, coastal New South Wales, and Eastern Victoria. All the known races were shown, the broad orange-branded ones occurring in the south and the narrow cream-banded races in the northern limits of the species. The manner in which the two types of races intermingled at Port Macquarie was illustrated by a large number of specimens caught within a few days of one another and within five miles of one another. This remarkable series showed every intergrade of colour and pattern between the races to the south and north of Port Macquarie. Mr. Waterhouse also exhibited a large drawer of well-known New South Wales butterflies, including examples of the various families to be found in N.S.W.

Mr. H. E. Finckh, a small artificially-warmed aquarium for tropical fish. During the colder months the aquarium is heated by a lamp placed below. It contained *Xiphophorus strigatus,* a viviparous Tooth Carp from Mexico. In this fish, which is brilliantly coloured, the lower rays of the caudal fin are elongated and sword-like, quite as long again as the body of the fish. The water is maintained at a uniform temperature of 75 deg. Fahr.

Miss Gladys H. Froggatt, a collection of Stick and Leaf insects (*Phasmidae*), from New South Wales.

Mr. W. W. Froggatt, a fine collection of gall-making Coccids (*Brachyscelinae*), illustrating life-history; Australian and Island metallic-tinted beetles, a study in brilliant colouration. Fossil *Graptolites* from Bendigo, Vic., Bone Breccia from Wellington Caves, N.S.W., and fossil bones from a subartesian bore near Brewarrina, N.S.W.

Mr. L. Gallard, a fine series of insects associated with the common Tan Wattle (*A. decurrens*), of noxious and friendly insects affecting orchards and garden crops in general, and a collection of orchard scale-pests. Also some interesting ant-lion larvæ, and a beautiful series of moths (*Porina*), showing variation of wing pattern.

Mr. David G. Stead, F.L.S., General Manager of the State Trawling Industry, made a fine exhibit of various species of fish trawled within a few miles of Sydney, in depths ranging from 40 to 60 fathoms.

A number of curiosities and objects of interest trawled from the deep were also shown, these including portions of wrecks, objects which had been dropped from passing ships, etc., as well as a number of beautiful mullusca. The various fishes (which were not preserved, but were shown in the fresh condition against a background of white) made a unique exhibit. Mr. Stead's exhibit was, at close of meeting, distributed amongst the audience.

Mr. A. S. le Soüef, a pair of opossum mice, *Dromicea nana,* captured at National Park, and *Sminthopsis crassicaudata,* a small marsupial mouse from Widgiewa Station, Western New South Wales. These dainty little creatures, which were alive, excited great interest.

Mr. Wickham, a fine collection of fresh specimens of Wild Flowers, including a large series of wattles.

PRESIDENTIAL ADDRESS.

"THE NATURALIST IN RELATION TO MODERN SCIENCE."

By E. S. Edwards, M.A.

The dramatic incidents of the great war, upon which is focussed the almost undivided attention of the nations, have absorbed almost all public and private attention, to the exclusion of equally important and less conspicuous features of the great conflict. The same may be said in relation to the probable results of the war. Here and there certainly a voice is raised to point out that of these results, the changing of the map of Europe will be as a passing incident in comparison with the mental revolution which it will produce. There are already in every sphere of mental activity signs of quickening, as when the springtime of colder climates follows the departing winter. As the present conflict of arms has surpassed the anticipations and outdone the imagination of all men, so the renaissance which will follow its conclusion will, in every range of mental activity, I believe, be beyond our wildest dreams. At the time when the present war broke out the world had arrived at a stage of material prosperity, the result of the application of scientific ideas and forces, unprecedented in the history of mankind. Science had shown the world how to create vast wealth, and, generally speaking, the main object of everyone, whether by organised bodies or in other ways, was to secure at least an adequate share in its distribution. The economic triumphs of science had focussed contemporary attention almost wholly on this aspect of it, and possibly because of this purely materialistic outlook it was opposed at first so bitterly and unreasonably as a necessary part of the curriculum in our universities and schools. The geologist was useful because he could find oil and artesian water and minerals, the botanist because he could supply new varieties of plants or increase the productiveness of known ones, the entomologist because he could devise methods to combat destructive pests. The material value of this work could not be denied, and probably at no period of history had the material side of life been so attractive and so absorbing. Into the midst of these conditions the present war intruded itself. It was as if some foul magician had waved his wand, and before it the enormous wealth which science had made possible commenced to dissipate in untold millions. No estimate can be made of the loss to this date. National debts are but a part of the enormous loss, and it has not nearly ended yet. The loss to us of those who are the producers of wealth, the strongest and bravest of our manhood, the best of the world, is incalculable, and they have been destroyed in millions. Science, too, has made this possible. Fifty years ago such a war was an impossibility; the destruction of life and wealth at its present appalling rate could not have happened then, but science has made it possible to-day. Surely this is sufficient to make us pause and think. And in the midst of this great overthrow, men and women are, in increasing numbers, thinking most seriously. As the conflict dies out, as the excitement slowly passes, the hour of general criticism will approach. Into the crucible of a criticism such as never has been before, will pass every convention and idea—religious, scientific, philosophical, and social. There will be a heart-searching enquiry into all the conventions to which we have readily given acceptance. The tortured of these years will demand, in their millions, to know how these things can be and why. But it is with the position of science that we are concerned for a few moments to-night, and I am led to a consideration of my subject because I think we shall find some convincing answers at the great bar of universal criticism in the Naturalist's relation to that great body of organised knowledge which we call modern science. Fifty or sixty years ago science was associated in the public mind with fierce theological and philosophical discussion; to-day, as I have already emphasised, it is connected with economic advancement and material power. It is only in the latter half of the last half century that it has appeared in this new dress, and in an entirely different one throughout the preceding ages of the world. Not much more than half a century ago a small body of British Naturalists produced a mental, philosophical and religious revolution, such as I am bold to say has never been since time began. Science has not, therefore, till comparatively recently, been synchronous with the increase of wealth. We are losing sight of the fact that it has previously had other work to do, and still has other work to perform, besides that which is economic. But if we are to realise this, if we are to grasp the significance of our present position, it will be necessary to know ever so slightly something of the past. I must ask you therefore to take a brief cursory glance backward.

The struggle through the ages has been a perfectly clearly-defined one, so far back as history and legend can take us; it has been to substitute for supernatural explanations of natural phenomena, material and physical explanations, and ordered and systematised knowledge for incomplete knowledge and legendary lore. It has been a long effort, and its eventual success has produced very wonderful results. The various phenomena themselves were objects of worship in the earliest ages, and wherever a reasoned explanation was wanting, and generally speaking that was everywhere, the mysteries of nature were explained by supernatural powers, good and evil. Primitive tree worship is, we are assured, found almost everywhere in the earliest stages of civilisation. Amongst the Greeks there was a relation between the trees and flowers and living spirits; the explanation of growth and life was the presence and birth of nymphs, with whom grew up the trees of the forest and flowers of the field, and the processes of decay were explained by the death of the nymphs. The phenomena of life and growth, of age and decay were accounted for by supernatural agencies. These explanations themselves militated against investigation into the world of nature, because to do so was to interfere with spiritual beings who would visit upon the offending heads of such transgressors punishment of an undesirable character. All beliefs in supernatural agencies have led to some kind of worship, with its accompanying priesthood and ritual. Any interference with these beliefs infringes on the rights of the priesthood, and meets with its fierce opposition, or is strenuously opposed by those who honestly think that any attempt to destroy accepted beliefs will result in the decay of morals and the downfall of society. More often trouble arises, as Paul found to his cost at Ephesus, because the new thought is in conflict with vested interests. Some believed in the transmigration of souls into mulberry and laurel trees, or into the mint plant or the hyacinth. It was a beautiful supernatural world that those enquirers into the phenomena of nature built up for themselves in those far-off days. The shape and colour of leaves and flowers they accounted for by the busy weaving of forest nymphs, and the colour of the grape as the work of some gracious member of that great body of enchanters of another world. Those who were strikingly in love with Nature were termed by the Greeks Nympholepti, as if the spirit of the nymphs had intoxicated them. Perhaps this feeling has not changed, but exhibits itself in other ways, even in this twentieth century of progress and supposed diffusion of knowledge. Is not the Naturalist to-day still regarded in many unexpected quarters as a trifle strange, as a rather peculiar individual amongst his fellows? Once the fascinating call comes to an individual he enters into love and communion with Nature, feels its throbbing life, is sensitive to its moods and its varied manifestations in organic and inorganic life. Amongst the Greeks the many and varied processes in the vine were accounted for by individual spirits till the grapes ripened and the wine was made. "Where we to-day are cognisant of chemical changes, they saw intervening spirits," says Walter Pater. The story of Demeter and Persephone, as an explanation of the seasons, is universally known. How the legendary return of Persephone from Pluto's realm resulted in the unspringing of the flowers and the leafing of the trees, of the growth of grain and the succeeding harvest. How the departure of Persephone to the underworld for a few months plunged Demeter into deep grief, and the world became cold and desolate. All the world of Greek mythology was full of beauty and suggestion, and they associated every phenomenon of nature with supernatural power. And while I am referring to this, it is singular that in a dim uncertain way, and yet after all a very real way, the ancient Greeks anticipated some of our most revolutionary modern scientific theories. The Heraclitean doctrine of perpetual movement is, after all, but an anticipation of our modern idea of development. That which the research of modern Naturalists has proved to be true beyond question lay in embryo, as it were, in the Greek mind. The evolution of existing species referred to ceaseless movement. We are aware that nothing rests, everything is changing—our bodies, the speech upon our lips, the form of our ideas. Anaxagoras, who had for his pupils Pericles, Euripides, and perhaps Socrates, laid the foundation of the atomic theory, and believed in an infinite intelligence in the universe. This bold adventurer in Greek life lived two thousand three hundred years ago. But his attempts to explain physical phenomena by natural causes met with the same reception as equally fearless original thinkers in recent days. He was accused of an act of impiety against the gods, and further, was arrested and tried for it. Through the able defence of Pericles, he was acquitted, but left Athens after the trial and died on the Hellespont. This was in the golden age of Greece. I lay stress on this fact as a striking instance of what I have already emphasised, viz., that the supernatural explanation of natural phenomena has been always the great hindrance to scientific research. It was not every Greek who could get a Pericles to defend him, and even under these special circumstances, it was a dangerous practice in which to indulge. This fear persisted steadily down the ages, and the hopelessly inadequate methods of compiling and describing natural facts existed side by side with it.

When we come down to Naturalists such as Pliny, we find them little more than transcribers and compilers. They narrate stories without testing their accuracy, and never consult Nature to prove the truth of their statements. The more improbable the story the more ready are they to repeat and believe it.

The advent of Christianity in the Western world, and the gradual discredit of mythology, brought in a new age, in which the Naturalist may almost be said to be forgotten. With the compilation of the Bible and its acceptance, subject, of course, to ecclesiastical interpretation as the final judgment upon all questions, the causes of the phenomena of nature were referred to these authorities, and for the poetic mythology of Greece was substituted a harder, cruder explanation, with an equally strong sacerdotal and ecclesiastical force behind it. The places of eternal punishment and reward were based on the ecclesiastical conception of the earth's place in the solar system, and the unfortunate fact was, that the discoveries of science always came in conflict with this, or with some other accepted ecclesiastical idea. There was little inducement, for other reasons, to indulge in scientific investigation. The other-worldliness of the mediaeval age was entirely opposed to it. The world, the human body, and everything material, were considered to be an obstruction to self-realisation. Between these, a judicious administration of the rack, and equally persuasive methods, there was little inducement to seek a natural explanation of physical phenomena, or to give publicity to such discoveries, since they conflicted with ecclesiastical opinion or the authorised interpretations of Holy Writ. Fear was always standing in the way of the Naturalist, either the fear which arises from superstition or that which was based on authority. Ruskin was of opinion that Dante exhibits in his great comedy a fear of mountains, that there was a certain sanctity and terror associated with them in his mind; and if this can be said of the great genius of the Middle Ages, what may not be imagined of the people in general!

Between the Greek philosophers, such as Aristotle and Herodotus, who made some study of botany, and Theophrastus, who interested himself in the morphology of plants to the year 1532, is an appallingly long stretch of time, but the first record that I have been able to discover of a collection of plant species is of that date. Aristotle is regarded as the first of entomologists, but the progress from his date onward could scarcely be considered overwhelming when we find an Italian busy disproving the theory of the spontaneous generation of larvae, in the latter half of the 17th century. Even down through the 17th and into the 18th century, the presence of shells in the rocks was attributed to the Noachian deluge. In about the year 1634 Galileo was persecuted by the Inquisition, and compelled to retract his statement that the earth revolved round the sun.

While writing this paper I chanced across some remarks by Mr. Frederic Harrison in the *Fortnightly Review* of June, 1918, and as they are extremely appropriate to my subject, I take the opportunity of quoting them here:—

> "Turning to the scientific treatises of Bishop Wilkins (1614-1672), a founder and first secretary of the Royal Society, I was struck by a singular point in the history of science and religion. Wilkins, a man certainly of original mind, the inventor of the term 'submarine navigation,' and the first to consider the problem seriously as a competent mathematician, published, in 1640, a learned Discourse in 150 pages, to prove that the earth is a planet, and goes round the sun. And this adventurous essay, full of some sound, and much absurd, mechanical science, was published in a fifth edition in 1707, twenty years after Newton's telescope, seventy years after Galileo's Dialogues, nearly one hundred years after the publication of Kepler's New Astronomy, and nearly two hundred years after Copernicus began to revolutionise our conception of the solar system. And Wilkin's Discourse of 1640 was published twenty years after the *Novum Organum*, many years after the death of Bacon, and some years after the Geometry of Descartes. That is to say, it required some two centuries before even men of science were quite certain that the earth moved round the sun."
>
> "When we read these mathematical tracts of Wilkins, published just a hundred years after the Reformation, in the very dawn of modern philosophy and physical science, we may see how original thought was in the bondage of ancient fetters, even in the lifetime of Descartes, Galileo, Pascal, Hobbes, and Toricelli. Wilkins, keen, learned, ingenious as he was, is dominated by three forces—antique

learning, false observations of natural phenomena, and the Scriptures. He quotes Pythagoras, Aristotle, Pliny, Seneca, Plutarch, Josephus, Tycho, Kepler, Galileo, all as of equal authority. To them he adds citations from schoolmen Renascence physicists, Dr. Gilbert, both Bacons, and Talmudists. An observation recorded by Mendoza, or by Fracastorius, by Vallesius, or Fromondus, is to Wilkins as conclusive as anything seen by Galileo's telescope, which, by the way, he does not cite. Lastly, he feels bound by the words of Scripture, and he labours to show by a crowd of theological witnesses that Revelation nowhere compels us to believe our earth to be the only world, nor that the sun goes round the earth. The Bible, in fact, seems far more repressive to Free Thought, even than Pope, Council, and Inquisition. The moral of all this is to show how the progress of science, even of mechanical invention and of human civilisation, depends on the solution of ultimate problems of philosophy and religion.''

Amongst the greater number of people through many centuries there persisted a belief in fairies and similar supernatural beings. Destructive or unusual occurrences in nature were often ascribed to them.

The powers of the nymphs and fairies of the *Midsummer Night's Dream* are not the creation of Shakespeare, but the reflection of a common belief amongst a great proportion of his contemporaries. Titania explains the drowned fields and rotting corn and other unusual misfortunes of the season by Oberon's jealousy. And a similar belief was common to all Europe. But the 18th century saw a great advance in the study of Natural History. The great systematists, such as Linnaeus (1707-1789), were gathering and organising knowledge for the greater Naturalists of the next century. Gilbert White of Selborne (1720-1793), has always been a landmark in Natural History. He is the highest type of his time, remote from the great world, and, with the exception of a few correspondents, cut off from other workers in the same field. His work is connected with the village of Selborne, and he has not yet reached far beyond the particular knowledge of the life of Nature about him. No disturbing questions of a philosophical character arise in his mind as the result of his investigations. He is interested in the migration of birds, but seriously doubts its general truth, though it may be partially correct. He is troubled by the inaccurate statements of observers, and is not quite sure that swallows remain torpid in winter. Some were of opinion that they conglobulated below the waters of streams in that season.

It is a localised life he leads; he follows quite fearlessly his investigations, observes closely, and accepts as true only those things which have been amply verified. But his knowledge is not organised, nor his facts related to the whole body of knowledge. The experiences of the next fifty years are to produce another outlook far beyond his own. It is difficult to imagine what he might have done had he found his investigations clash with his religious beliefs. His field of work was too restricted to enable him to organise his facts and his investigations. With him passes away the old-style Naturalist, to be succeeded by the writers of monographs, and the great Naturalists of the Victorian era.

But the final act, it appears to me, in the great struggle through all history, the final scene in the age-long effort to free the mind so that it might no longer be bound to explain the material by the supernatural, is consciously entered upon in the year 1857. Already the progress of geological discovery had unsettled many minds. No one of whom I know has given us a better idea of the revolution of thought, and of the great mental crisis produced by the publication of the theory of the mutability of species, than Edmund Gosse, in that remarkable human document, "Father and Son." Lyell, the geologist, was a great organiser, and a man of strong personality. He considered it necessary to organise a band of Naturalists who were in agreement in regard to the new theories, to stand united amidst the howl of execration, which, he felt assured, would follow the giving of these to the world. Amongst them were Wallace, Hooker, and Darwin. It was a little band of fearless men who, meeting truth, had acknowledged it. It was difficult for the very great majority to accept ideas which upset their preconceived ideas of creation, and the theological teaching of many generations, involving the denial of the fundamental theories and beliefs of their lives. Edmund Gosse's father was a great Naturalist and a gifted writer, adding to his profound knowledge of Nature a literary style and powers of expression which delighted a vast audience of leaders. I, for one, in my boyhood days, loved his stories of Nature, and read them again and again, fascinated by their charm. Gosse, the elder, was approached to join with the great leaders, but his son says "he allowed the turbid volume of superstition to drown the delicate stream of reason." He took one step in the service of truth—for at first he favoured the new ideas—and then he drew back in an agony, and accepted the servitude of error. I mention this, because it is an undoubted picture of many another soul, and mirrors the mental distraction of thousands. I would emphasise the fact that this great movement was a British one; it has for ever altered the mental attitude to the world about us, and to the principles by which all seek to interpret it. No theories of Scriptural explanation but the explanation of natural phenomena by natural causes only, had come for good. We must acknowledge facts as they are revealed by the serious investigator, no matter how they may come in conflict with our most cherished superstitions. and I have endeavoured to show that the great hindrance to science through all the ages has been, on one hand, the superstitious dread of its relation with unseen powers, the absence of means to correlate knowledge, and the extreme readiness to accept explanations which were not closely investigated and needed careful proof.

The great revolution caused by Darwin, Wallace, and their contemporary Naturalists, is still too near to us to enable us to see it in a true perspective, and to realise its marvellous influence. It threw open the gates of knowledge to every fearless enquiring mind; it gave such an impetus to scientific research that we, still feeling the impulse of the movement, are not sufficiently detached to measure its effect. It is not yet possible to realise the enormous influence of that great Naturalist movement. I wish, however, to point out that science has done infinitely more since that movement than in the previous 2,500 years. The influence of the new learning produced the great movement in Europe known to us as the Renaissance, but I boldly assert that it is second in power and importance to the momentous influence of the great Naturalists of the Victorian era, and am convinced that not nearly sufficient emphasis is placed on the influence of this movement in our historical summary of the latter half of the 19th century. Of one great change since then we are very conscious. From that great mental and philosophical change we have passed to an age of economic science. Science to-day is associated with greater wealth, increased dividends and wider opportunities for pleasure, and since war has claimed all our energies and attention, with every death-dealing appliance on one hand and every means to restore life on the other. The material side is dominant, and I come back to the minds who, arrested by the disorder of the world, are proceeding to ask what it all means.

The enquiring mind surveying the new conditions, measuring the gain and loss, asks, since after all it has not removed the old national conditions of strife, on one hand, and national poverty on the other, what it is all worth. Science has disturbed the mental outlook of millions, has made old beliefs and many sweet superstitions impossible. After all, is it such a triumphant success as we are led to suppose? It has done nothing to aid the disappearance of war; in fact, it has only made it more infinitely terrible and destructive. It has disturbed the religious beliefs of thousands, and vast hosts of people can no longer accept the creeds they once accepted, and the stories of religion learnt at a mother's knee. With what are they to replace it? Slowly, but imperceptibly, from this great sweltering chaos of confusion, of murders, and terrorisms of the great war, is arising a wider, if less defined belief, in which we shall reason back from life's noble deeds and sacrifices, sweetness and duties, to some accepted religion of love and hope and duty, removed from all ecclesiastical authority, and dependent for its acceptance on its results. This is a great period of transition in which, as I have already emphasised, we are turning enquiringly to ask what all these things about us mean, and whither we are progressing now. No mental crisis so great has ever yet been upon the nations of the world, and so far as science is concerned, it is faced with serious questions, which it must answer. And it is because I think that the Naturalist, in his place amidst the complications of modern science, can answer adequately many of these enquiries, and remind the world that science has its poetry and its music, has its places of inspiration, its contact, if I may be permitted to suggest it in such an address as this with what may possibly be *not* material, that I have been led to the present consideration of its relation to modern science. You cannot divorce feeling from her mate the deed, you cannot live on cold facts; "it is the heart and not the brain that to the highest doth attain," and the Naturalist's relation to the facts of Nature are something more—indeed, a great deal more than the mere relation of a mind to the differential calculus, or the principle of gravity, something more than to a chemical formula or a triumph in physics. Fabre, the French Naturalist, of whom and of whose works we have heard and read a great deal lately, called Nature, a prodigious poem; "all Nature filled him," he says, "with curiosity and wonder." A voice, he says, "charmed him; untranslatable, sweeter than language, vague as a dream." I have already referred to the fact that the Greeks termed these to whom Nature gave the great call Nymphelepti, as being inspired by, or in some way intoxicated by, Nature, and Fabre would be one of these. Indeed, in a more or less degree, so are all Naturalists; and it appears to me that the spirit is present in nearly all people. This very enthusiasm has possibly a material explanation. The humblest Naturalist has felt this in his searches face to face with Nature. What I feel is this: that the spirit of wonder exists in every child, and a natural instinct calls him to Nature; but how few are directed in the way? To observe correctly and systematically is as difficult as to reason accurately, and to observe Nature as we should is not a usual accomplishment. Observation, of course, in its highest examples, is pure genius. Fabre, in his researches into the Scarabeus, whose history since the time of the Pharaohs had been a tissue of legends, required observation and research, extending over forty years to complete the study of its habits, and to solve the mystery of its cradle. But it is not to observation so highly developed that I refer, but to simple ordered observation, of which the most ordinary person is capable. If it were possible to take every child in its early life, and let the spirit of wonder grow by bringing it face to face with Nature, what would result? You would fill the child with the magic mystery and poetry of Nature, and open its eyes to the miracles of beauty and wonder at its feet! It is not at all impossible to do this. Remember, however, the imagination of science is ordered and controlled. The magic and the mystery and poetry arise not from mental feelings only, but from mental feelings aroused by a knowledge rightly gained by correct and patient observation. It is the marvel and wonder of the little lives, and the wondrous habits of plants and insects and animals, the inter-relation and inter-dependence of these, that arouse our wonder and control the imagination which they aid.

It is urged that science has made the pace so fast to-day, will accelerate it so much in the future, that it will be a world of shaken nerves, with a prospect of new nerve disorders. Science has her corrective in the Naturalist. You must put on the mantle of patience and wait for Nature to unfold her many mysteries. You must watch with concentrated attention, but Nature never hurries. All those qualities which make a true manhood and womanhood are expressed in the work of the true Naturalist; the discipline which comes from ordered thought and careful observation and research; the sympathy which is essential to true knowledge everywhere. We cannot know our fellows rightly without sympathy, which leads to insight, and we can never succeed in naturalistic work without the same sympathy. We must get into touch with Nature, breathe that strange indescribable yet communicable spirit which pervades her. All the correctives necessary in the great advances of science are to be found in the Naturalist. Let me ask you, as I proceed to a conclusion, would it be possible, if all men had been led in youth to an intimate acquaintance with Nature, had heard the grand majestic symphony of ocean in their ears, had listened to the music of running streams, the laughter of the winds; had caught the lyrical voice of Nature, and wandered observantly, thoughtfully amidst her thousand marvels, that such a war would be possible? I answer unhesitatingly No!! Political institutions, social conventions, theology—all branches of thought—will be brought before the bar of human investigation as this great and awful conflict draws to an end. Science, through the Naturalist, will fear nothing, and answer clearly and convincingly for itself.

For us, as a body of Naturalists, there is much work to do. I have referred little to the fact that by our work we add to the world's knowledge little by little, doing our part in the great work which, steadily systematised, makes the great body of scientific knowledge; but I have pointed out that our work has even a higher aim. It is for us to draw into communion with Nature all we can, to show to others the wonders of seashore, of stream, and mountain, and plain. Ours is to call others, as did the poet-naturalist of Galilee, to "consider the lillies how they grow."

Modern science has a twofold work to perform. On one side it will increase wealth, make production so infinitely great that there will be ample for all men. It will be the means of enabling all to have sufficient wealth, and to drive from our world the haunting fear of poverty. It is a glorious prospect on the material side of scientific work, and on the other side the Naturalist will keep alive the spirit of wonder, of love, of beauty, of sympathy, of discipline—in fact, will be the poet and the preacher of the world of science. But where, says someone, can the Naturalist find comfort for aching hearts for those whom this cataclysm has robbed of those who are dear to them? And the poet answers:

If thou art worn and hard beset
With sorrows that thou would'st forget,
If thou wilt learn a lesson that will keep
Thy heart from fainting and thy soul from sleep,
Go to the hills and woods, no tears
Dim the sweet look which Nature wears.

NOTE.

Annual Report of Council and minutes of several meetings held over to next issue.—Ed.

BALANCE SHEET FOR YEAR ENDING 31st JULY, 1918.

RECEIPTS.

	£	s.	d.	£	s.	d.
To Balance				133	10	11
,, Subscriptions				37	0	6
,, Interest—Savings Bank	2	12	3			
,, ,, War Loan	2	5	0			
				4	17	3
				£175	8	8

DISBURSEMENTS.

	£	s.	d.	£	s.	d.
By Printing Journal	37	6	6			
,, Block	1	4	0			
				38	10	6
,, Notices of Meetings				11	10	6
,, Box, G.P.O.				1	0	0
,, Donation to widow of member killed in France	2	2	0			
,, Wild Flowers to Vict. Nat. Club in aid of Y.M.C.A. National Fund	3	0	0			
				5	2	0
,, Bookcase				4	12	0
,, Petty Cash, Postages, etc.				9	0	9
,, Balance—Savings Bank	49	18	1			
War Loan	50	0	0			
Cash in Hand	5	14	10			
				105	12	11
				£175	8	8

Examined and found correct—

G. N. HEWISON,
E. H. ZECK,
Hon. Auditors.

H. E. FINCKH.

10th August, 1918.

THE

Australian Naturalist.

VOL. IV. APRIL 1, 1919. PART 6.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

1st October, 1918.—The President, Mr. F. W. Carpenter, M.A., in the chair, and about 26 present.

A letter was received from Mr. A. E. Watson, apologising for absence, and stating that his son had been killed while on active service in France. On the motion of the President, it was resolved that a letter of sympathy be forwarded to Mr. Watson and family. In adopting the resolution, the assembly rose to do honour to the fallen hero.

The following were elected members:—Misses Ashton and Lawrence, Mr. J. Stinson.

Mr. A. A. Hamilton exhibited specimens of Tamarisk, Sycamore Fig, and Christ Thorn, and read a note, "Trees around Gaza," sent by Mr. W. M. Carne (Light Horse), Palestine.

Miss Sulman exhibited from Mount Wilson four epiphytes, Pencil Orchid, Lycopod, and Fungi.

Mr. E. Cheel delivered a lecture, "A Naturalist's Trip to Fiji." The lecturer touched upon many points of interest to the Naturalist, giving an interesting account of the native population, imported labour, mode of travelling, and civil life. A vote of thanks was accorded, and carried by acclamation.

5th November, 1918.—The President, Mr. F. W. Carpenter, M.A., in the chair, and about 30 members.

Messrs. K. B. L. Lumsdaine and G. Murray were elected members.

Mr. W. W. Froggatt exhibited the life history of a small native bee; Miss Steinbeck, flowering red *Eucalyptus*, and *Polyzoa;* Miss Winter, earth-cell of earthworm.

Mr. H. E. Finckh spoke of the difficulties imposed on students through the continual unnecessary alterations to scientific names carried out by systematists.

Mr. A. G. Hamilton gave a most fascinating lecture on "Pollination of flowers," illustrated by very fine lantern slides, special attention being given to the subject of self-pollination. Mr. Hamilton emphasised the need for further work in this field, mentioning specially the Boronias and Eristemons.

In moving a vote of thanks, Miss Sulman mentioned the great help which she had received from Mr. Hamilton in the course of her own work.

3rd December, 1918.—Mr. A. A. Hamilton in the chair. The following were duly elected members:—Messrs. A. C. Duckworth and E. L. Hoyes and Rev. J. Thomas.

The Chairman announced that Mr. Shiress had tendered his resignation as Hon. Secretary, owing to extreme pressure of business, and that the resignation had been accepted with much regret by the Council. On the motion of Mr. Edwards, seconded by Mr. Stead, Mr. Shiress was thanked by the members for his eminent services. Mr. E. S. Edwards, at the request of the Council, had agreed to act temporarily as Hon Secretary.

Mr. A. A. Hamilton read a paper, entitled "The Effect of Sunlight on Plants." Mr. D. G. Stead, F.L.S., delivered a most interesting and instructive lecture, "Whales and Dolphins."

Miss Sulman exhibited *Goodenia decurrens*, illustrating three stages of pistil development. Mr. A. G. Hamilton and Archdeacon Haviland discussed the exhibit with special reference to plant pollination.

ANNUAL REPORT.

Your Council has pleasure in presenting its 7th Annual Report, and of congratulating the members on the excellent position of the Society. Notwithstanding the dreadful war, which has helped to thin our ranks, by the enlistment of some of our members, and the general leavening effect of the strife which is raging, our membership has been well maintained, the enrolments balancing the withdrawals.

The disastrous strike which occurred in the early part of the Society's year prevented the Annual Meeting being held in August, and interfered with two of our outings—the first of which was held at Maroubra, under the leadership of Mr. A. A. Hamilton, and formed a most interesting finale to his Presidential Address.

Whole day outings were held to Heathcote and Woodford, afternoon outings to La Perouse, Balmoral, Oatley, Brighton-le-Sands, Hornsby, Lane Cove; and we have to thank the ladies and gentlemen who kindly acted as leaders. Three Members' Nights were held during the year, and proved a great attraction, some fine original work being the result.

Lectures were delivered by the following, and we take this opportunity of again thanking the lecturers for their kind services:—"Shore-line Vegetation," by Mr. A. A. Hamilton; "The Use of Photography as an Adjunct to Nature Study," by Mr. F. W. Carpenter; "Trawling in Peacetime and in War," by Mr. D. G. Stead; "Some Essential Oils from Australian Plants," by Mr. H. G. Smith; "Flies," by Mr. W. W. Froggatt, F.E.S.; "A Naturalist in South Africa," by Mr. A. S. Le Souef.

The average attendance at the meetings was 33.

Owing to the courtesy of the officers of the Department of Education, our library has been placed in the Assembly Room, and Mrs. W. M. Carne has kindly undertaken the office of librarian, with Mr. N. Hewison to assist her, and the members will now be able to exchange books at the monthly meetings of the Society.

Our thanks are tendered to our Honorary Editor, Mr. Thomas Steel, F.L.S., for his unremitting care of the *Australian Naturalist* (our quarterly review), and also Mr. C. J. White, Honorary Lanternist, for his many kind acts and the great assistance he has been to the lecturers, performed at times at inconvenience to himself.

The thanks of the Society are also due to the Minister of Education, and his Chief Secretary, Mr. P. Board, for the free use of this fine room.

E. S. Edwards, President.

POLLINATION OF SOME AUSTRALIAN PLANTS.

By A. G. Hamilton.

(Read 5th November, 1918.)

Darwin showed that it is of great importance to the plant as a *species*, not as an *individual*, that it should be fertilised by pollen from another individual; and that if a flower be pollinated by itself, it is disadvantageous to the individuals produced from the resulting seed. Still, there are some flowers which are regularly fertilised by their own pollen, or, as it is technically termed, self-pollinated.

To any one examining an ordinary flower, it would seem as if self-pollination must be the rule, as the anthers are so close to the stigma that the pollen must reach that organ. But Nature gets over this difficulty in several simple ways.

The anthers mature first and drop the pollen out, but the stigma is not then in a fit state to receive it, and the pollen drops off, or is blown or taken away. Then the stigma matures, and is ready to receive pollen. Of course there is always a chance of the flower's own pollen remaining on the stigma, but again Nature provides a remedy. She makes the pollen from distinct individuals prepotent over the flower's own pollen, and this is carried so far that in some cases the flower's own pollen, as Darwin showed, is actually injurious to the stigma, sometimes even causing its death. Plants whose pollen ripens before the stigma is mature are said to be protandrous, and this is the commmonest method of preventing self-pollination.

In other plants the stigma becomes fit to receive pollen before the anthers dehisce; this is termed protogyny.

A third method is the separation of the pollen, and ovule-bearing flowers; either they are on separate parts of the plant or they are on different plants.

These three states of the flower, then, are the factors which make cross-fertilisation the rule amongst the flowering plants.

Since plants can rarely be fertilised by their own pollen, we have next to consider what provision is made to convey pollen from others flowers at the proper time. Some agents are necessary for this, and they are, 1st, wind; 2nd, water; 3rd, living organisms. Among our native plants, *Casuarina* is a good example of wind pollination. The flowers of wind-pollinated plants are usually inconspicuous; their stamens are usually on very long and slender filaments, so that they are easily shaken by the wind. They produce large quantities of small very light pollen grains, sometimes, as in a few pines, winged. The stigma is usually much divided, so as to expose as large a surface as possible to the chances of being reached by the flying pollen grains.

The living things concerned in carrying pollen are—(1) Insects; (2) snails; (3) birds; and (4) mammals; but the bulk of the work is done by the first and third groups. But insects and birds do not work for nothing, and so the plants have to provide some attraction for them. There is no altruism below the primates (and not so much among them as one might desire to see). The means of attraction are—(1) Colour; (2) scent; and (3) nectar, or some other food. Some flowers depend upon colour, some on scent, and some use both as an advertisement. I think there can be no doubt but that insects are attracted by colour, although Plateau and other biologists have tried to show that this is not so. But I have no doubt at all that it does. Both Mr. T. Steel and myself have recorded a number of instances of moths and butterflies being attracted by coloured objects. And there are other recorded cases.

The signboards of colour and scent would soon be disregarded if there were no reward, and the nectar provides this; or, in the case of pollen-eating insects, the pollen. Colour for attraction is usually found in the petals, but sometimes it is the sepals, sometimes bracts, as in *Bougainvillea* and *Poinsettia*, and even in the leaves subtending the flowers, as in a beautiful *Brunsfelsia* common in the Botanic Gardens. In the case of small individual flowers, the advertising effect is got by massing them together, as in the snow-bush and the black-thorn.

The nectar again may be produced by any part, but usually it comes from glands in the centre of the flower. Wherever it is produced, it is always in such a position that an insect feeding on it brushes against the anthers and takes up pollen.

Very many flowers are of a generalised type, and may be pollinated by almost any insect visitor. But there are also large numbers of flowers which are specially adapted to be pollinated by certain groups of insects, or even by a single species. The same may be said of some flowers which can only be pollinated by one species of bird.

Clerodendron tomentosum, which grows plentifully on the shale soils about Sydney, is one of those which can be pollinated by one group only, in this case the hawk-moths. The tubular flowers grow in clusters, each tube being about one and a half inches long. The limb of the corolla is five-parted, and stands at such an angle to the tube that it affords no platform for flying insects to alight on. The flower is white and scented, but always much more strongly at night. The stamens, when the flower first opens, curve outwards and upwards, while the style curves downward and away from the stamens, the bifid stigma being closed. Moths visiting the flowers in this stage poise on the wing, and extend their probosces to probe the tube for honey. While doing this, the under sides of their bodies rub against the open anthers and take up pollen. Later, the stamens wilt and drop down out of the way, while the style curls upwards and the stigma opens, exposing the receptive surface. Moths visiting the flowers in this stage place pollen on the stigma. The white colour and increased scent at night point to its being pollinated by night-flying insects, while the length of the tube indicates that only insects with a very long proboscis can effect pollination. A plant in flower always has many hawk-moths buzzing round it. It is sometimes visited by the spinebill in the daytime, and the bird can also effectually pollinate it. In fact, many hawk-moth flowers are also visited by the spinebill. The common garden honeysuckle has the same methods, and is pollinated by hawk-moths too.

Eupomatia laurina is another plant having a special agent for pollination. It is a brush plant, with large glossy leaves. The sepals and petals form a cap like that of Eucalyptus, which drops off at flowering time. The stamens are in two rows; the outer, which hang down in a fringe, are fertile; while the inner ones are broad flat staminodes, which are closely pressed over the flat top of the ovary, in which the stigmas are embedded, and level with the surface. They are thus cut off from their own pollen. The flowers are very strongly scented, a scent like ripe pineapple, portwine, magnolia, with reminiscences of bad fish. If the flowers are handled, the scent clings to the fingers for a considerable time. The flowers open near the end of December, and are immediately visited by myriads of a small weevil (*Elleschodes eupomatiæ*). They alight on the fertile stamens, climb up to the top of the flower, and bore their way in to the disc, where they feed on a secretion produced by the disc. They drop off with the falling flower, and, dusted with pollen, fly to another flower, which they cross-pollinate while feeding. A few flowers are likely to be self-pollinated in the first visit or two, but afterwards cross-pollination is the rule.

In the related families Compositæ, Campanulaceæ, Goodeniaceæ, and Candolleaceæ, there is a similarity of mechanism, which, however, works very differently in each family.

In the Compositæ, the stamens are united in a tube round the style, the stigma is closed, and the upward growth of style and stigma pushes the pollen out. The outer disc florets open first, and as the visitors alight, they are smeared with pollen. The stigmas of the outer row then open, and are receptive, while the next inner row comes into the pollen-bearing stage. Insects coming from one flower-head, with a load of pollen, deposit it on the stigmas of the outer row of the next head they visit, and working inwards, take up more pollen, which again pollinates the outer rows in the next visited, and so on.

In the Campanulaceæ the stamens are also in a ring round the style. But the Campanulas and Wahlenbergias differ from the Lobelias in the method of pollination. In *Lobelia* the anthers open, and the growth of the style, crowned by the closed stigma covered with a brush of hairs, sweeps the pollen out. The flower is horizontal, and insects alighting on the lip and inserting their heads in the tube, receive a load of pollen. When the brush-like head emerges from the tube, the hairs dry up and drop off, and the stigma opens, exposing its receptive surface. Visiting insects then deposit pollen on it, and pollination is complete.

In *Wahlenbergia* and *Campanula* the ring of stamens is below the closed stigma. When they dehisce, closely pressed to the style, the pollen adheres to sticky glands on the style. At this stage the flower opens, and the stamens dry up and drop out, leaving the style coated with pollen. Bees visit the flower, and forcing their way between the style and walls of the corolla, become coated with pollen. After the pollen is all removed, the trifid stigma opens and curves downward, so that a bee cannot get into the bell without rubbing against one or other branch of the stigma and leaving pollen there.

In the *Goodeniaceae* we again find the ring of stamens. But the immature stigma is surrounded by a deep cup or indusium, the edge of which is furnished with a stiff border of hairs. In the bud, the mouth of the cup is just below the base of the ring of anthers, and before the flower opens the style lengthens rapidly, and the brush-like edge of the indusium sweeps all the pollen out of the dehisced anthers, and it falls into the cup. This then closes, the flower opens, and the style takes up such a position that when an insect forces its way into the tube of the flower, the mouth of the cup comes down, and touches the visitor on the back. At the same time, the immature stigma is growing up from the bottom of the indusium, and gradually forces the pollen out through the margin of hairs, ensuring a patch of pollen being placed on the insect's back. Finally, the stigma grows out, becomes mature, and when the flower is visited, takes up pollen from the visiting insect.

In the *Candolleaceæ* (Trigger plants) we have the most complicated mechanism. The stamens are reduced to two, and the filaments and style have grown together, so that the two anthers are on either side of the stigma. This combined organ is called the column, and bends out of the flowers on the front side. Insects (mostly bees) approach the flower from behind, and thrust their probosces down the tube. Immediately the column flies over, and the anthers strike the thorax of the bee, and deposit pollen. Later the stigma grows very large, and matures, and in this stage, when the column jerks over, takes up pollen. As the bees always begin on the lowest flowers, which are in the stigmatic stage, there is no likelihood of their being pollinated by their own pollen, or even by that of another flower in the same spike. The stem, being coated with glandular-headed hairs, prevents small ants, which could not, on account of their size, act as pollinators, from rifling the flowers of their nectar.

Members of the Society have an opportunity of doing very good work by observing methods of pollination in native flowers. For instance, the methods adopted by the Rutaceæ are not clearly known. *Eucalyptus* and *Acacia* have had little or no work done on them, and the Proteaceæ alone give a big field for valuable work. If our botanical members took up this field, we should soon have a valuable body of observations on a very interesting, but much neglected, subject.

LIST OF PAPERS AND BOOKS ON, OR CONTAINING REFERENCES TO THE POLLINATION OF AUSTRALIAN PLANTS.

By A. G. Hamilton.

The list includes papers dealing with species not found in Australia, but the genus of which is found there:—

Armstrong, J. B.—Fertilisation of Red Clover. T. and P., N.Z. Inst., xvi.-561.

Anonymous—On the Plants Most Visited by Bees in Various Districts, Ag. Gaz., N.S.W., iv.-90.

Bailey, F. M.—Fertilisation of Dendrobium Giulianettii, Q.J.Ag. iii.

Belt, Thos.—Fertilisation of Erythrina. Naturalist in Nicaragua, chap. 7.

Bennett, Geo.—Notes on Eupomatia laurina, Gatherings of a Naturalist, 363.

Bentham, Geo.—Notes on the Gamopetalous Orders belonging to the Campanulaceous and Oleaceous Groups, J.L.S., Bot., xv.-2.

Bentham, Geo.—Note on the Stigmatic Apparatus of Goodenoviæ, J.L.S., Bot., v.-203.

Bentham, Geo.—Notes on the Styles of Proteaceæ, J.L.S., Bot. xiii.-58.

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List of Abbreviations.

Ag. Gaz., N.S.W.—Agricultural Gazette, New South Wales.
Ann. Bot.—Annals of Botany.
A.A.A.S.—Report Australian Association for the Advancement of Science.
Aust. Nat.—Australian Naturalist, Sydney, N.S.W.
Bot. Mag.—Botanical Magazine, London.
Bull. Dept. Ag., Wash.—Bulletins of the Department of Agriculture, Entomology, Washington, D.C., U.S.A.
Gard. Chron.—Gardener's Chronicle, London.
Vict. Nat.—Victorian Naturalist, Melbourne, Victoria.
J.L.S. Bot.—Journal Linnean Society, Botany, London.
Nat. Hist. Soc., W.A.—Natural History Society of West Australia, Perth.
N.Z. Jour. Sc.—New Zealand Journal of Science, Dunedin.
P.L.S., N.S.W.—Proceedings of the Linnean Society of New South Wales, Sydney.
Q.J. Ag.—Queensland Journal of Agriculture, Brisbane.
T.L.S.—Transactions of the Linnean Society, London.
T. Bot. Soc., Ed.—Transactions of the Botanical Society, Edinburgh.
T. and P.R.S., S.A.—Transactions and Proceedings of the Royal Society of South Australia, Adelaide.
T. and P., N.Z. Inst.—Transactions and Proceedings of the New Zealand Institute, Wellington, N.Z.

TREES AROUND GAZA.

By W. M. Carne.

(Read 1st October, 1918.)

If we except date-palms, apricots, almonds, pomegranates, figs, olives, and other fruit trees, there are only *three* trees common in the area occupied by our troops before the fall of Gaza.

First, and most plentiful, are the *Tamarisks,* planted around the gardens as shelter trees. They are often mistaken for pine trees; but when the wind whistles through their jointed branchlets, the sound brings back memories of the she-oaks at home. It appears to be the chief local timber, and is good firewood, as every trooper knows who has smashed in the roof of a native house after the large limbs of this timber, which are used as roof supports. In Australia, tamarisks are sometimes planted under the name of "'Flowering Cypress''—there are a number in the avenue at Hawkesbury College. According to one theory, they were the source of the manna of the Israelites in the wilderness.

The *Sycamore Fig* is also usually found in gardens. It is a fairly tall, compact tree, with dark green leaves, and a curious habit of bearing its numerous fruits in clusters along the main branches. This unusual method of fruiting will remind orchardists of the spur-bearing habit of certain plum-trees. When fully ripe the fruit is succulent and delicately flavoured. The skin of the fruit may be eaten at the risk of sore tongues and lips. Tradition says that it was into one of these trees that little Zaccheus, the tax-gatherer, climbed, that he might see Christ passing by.

The *Christ Thorn* is the last of the three trees. Like so much else in Palestine, it too is bound up in the history and traditions of this old, old land. When the Roman soldiers in mockery placed a crown on the brow of Christ, with cruel humour they made it of the thorny pliable young branches of this tree, hence its name.

Scrubby when young, the Christ Thorn grows into a rather scrambling tree, easily recognised by its small bright green, three-veined leaves, and thorny branches. Its fruits are edible, and have a flavour not unlike a [illegible]y apple. Preserved in sugar, they form a favourite sweetmeat amongst Eastern peoples, known as "jujubes," so the tree is sometimes called a "Jujube Tree," though that name rightly belongs to a closely related species also found in Palestine, though not hereabouts.

Note.—Mr. A. A. Hamilton contributes the following note on the above plants:—

"The Tamarisks are species of *Tamarix*, and that mentioned by Mr. Carne as timber is *T. gallica* var *arborea*, a common shrub in Sydney gardens. The Sycamore Fig is *Ficus sycamorus*. The Christ Thorn is *Zizyphus spina-Christi*, and the jujube tree is *Z. jujuba*. It may be added one of the plants credited with the production of manna is *Tamarix mannifera*.

NOTES AND COMMENTS.

Ants and Flowers.—In seconding a vote of thanks to Mr. Hamilton at the meeting on 5th November, Mr. Froggatt described an extremely interesting relationship which had come under his notice. When the "Bumble Tree" or "Wild Pomegranite" (*Capparis mitchelli*) is in blossom, it is, during the day, frequented by large numbers of the common mound ant (*Iridomyrmex detectus*), which prevent access to the flowers by the native bee (*Anthophora preissi*), with the result that the latter has acquired the habit of working at night when the ants are absent.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

Owing to the prevailing epidemic of influenza, there have been no meetings between those held in December, 1918, and June, 1919.

THE EFFECT OF SUNLIGHT ON PLANTS.

By A. A. Hamilton.

(Read 3rd December, 1918).

A publication* was recently brought under my notice by Mr. C. Thackeray, containing an article on "The Trend of Modern Thought," in which attention is focussed upon solar energy as a creative factor. A section of the treatise deals with certain experiments conducted by Colonel Rawson, C.B., R.E., in which it is claimed that by regulating the hours of sunlight and shade supplied to plants he was able to produce double flowers from single ones, multiply the number of flowers, and alter the shape of the petals at will. He could also produce extreme alterations in the shape of leaves, and develop ribbon-growths (fasciation) in stems, and the coloration of flowers was demonstrated to be under his control by a similar process. My attention has for some years been directed to variations in form (morphology) and malformations (teratology) in plants, including double flowers and fasciation. In a paper† dealing with the instability of leaf form as a character in the identification of plants, certain factors affecting the growth of leaves were submitted, which will appeal to the ordinarily intelligent observer, e.g., differences in size of leaves, due to good or bad seasons (phenological); alterations brought about by environmental conditions, rich v. poor soil (edaphic), cold v. heat (climatic); shade, shelter, moisture, drainage, etc. Attention was also drawn to malformations arising from insect attack or mechanical injury. The remarkable alteration in the shape of the leaves of our Eucalypts and Acacias in their transition from the juvenile to the adult stage is common knowledge. That sunlight affects plants to a limited extent both mechanically and as regards coloration has long been known, the response of the Sunflower to sunlight (heliotropism) and the blanching of Celery (etiolation) by earthing up the stems and depriving them of light are familiar examples. On the rare occasions upon which a plant "sports," i.e., develops an abnormal growth, the plant propagator—if the development is of an ornamental character—expends a considerable effort in accentuating the novel formation, and fixing it. The care lavished upon our Dahlias, Chrysanthemums, etc., with the object of encouraging any vagaries in the size, shape, or position of the petals is a case in point. The susceptibility of the Cocks-comb (*Celosia*) to fasciation and spiral torsion has also been exploited by the floriculturist. If these alterations can be produced by the simple process of regulating the supply of sunlight, as is claimed by Colonel Rawson, this branch of horticulture will be revolutionised, and an art which at present is largely speculative will be elevated to an exact science.

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* "The Meaning of Life," Ed. by E. Kay Robinson.
† Proc. Linn. Soc., N.S.W., XLI., 152.

LIFE-HISTORY OF TIPULID FLIES.

By L. Gallard.

The larva of the Painted Crane Fly, *Gynoplistia bella*, I found under an old rail in a very damp place at Piper's Gully, Gosford. On August 17, 1914, I took several, and on August 22 one of them assumed the pupal stage, and duly emerged on September 20.

On January 7, 1918, under a piece of wood lying on wet sand in a gully near Narrara, I found a black object, which proved to be the larva of another common Crane Fly, probably *Ptilogyna ramicornis*. A fair number of further specimens were collected in similar situations in the district. The larvæ are large, soft-textured, bladdery-looking grubs, from one to one-an-a-half inches long, with very indistinct segmentation. When pupating, the skin hardens, and segmentation becomes very distinct. Two breathing spiracles also develop on top of the head. When fully developed the pupa is longer and thinner than the larva, the wing-pads are short, the abdomen is considerably flattened, and shows distinct ribbed segmentation. On January 7, a number of larvæ were placed in moist sand, and the adults emerged on the 24th of same month.

LIFE-HISTORY OF BUTTERFLY, *EUPLOEA CORINNA.*

By L. Gallard.

This butterfly, though rarely found as far south as Sydney has been rather plentiful about Epping in 1918. During March and April I collected larvæ and pupæ in numbers on the White Runner (*Mandevillia*). The larva is a rather slender banded caterpillar, somewhat resembling that of *Danais menippe*. It has eight erect fleshy appendages on the back, six on the thoracic segments, and two on the last abdominal segment. In its early stages the pupa is perhaps the most beautiful of our butterfly pupæ. It is of a bright metallic silvery sheen, which, however, becomes dark as development proceeds.

WHALES AND DOLPHINS.

By David G. Stead, F.L.S.

Read 3rd December, 1918.

(Abstract.)

Notes on the Larger Whales in the Waters of Eastern Australia.

The great natural group of Whales (using the term in its widest sense, and including the Dolphins and Porpoises), forms the division known as *Cetacea*. Cetaceans are warm-blooded, air-breathing mammals, possessing a somewhat fish-like form (as befits the aquatic environment), but in nowise related to fishes. Unlike that of the fish-form, the tail-fin is set horizontally. The other "fins" are the pectoral flippers, and the dorsal fin. The latter is practically only an extension of the skinny integument, and it not possessed by all species, (e.g., the Right Whales), but in some (e.g., the "Killers") is very high, indeed. The pectoral flippers are homologous with the arms or fore-legs of the terrestrial mammals; and, undoubtedly, all Whale forms are of terrestrial origin.

The Cetaceans are divided into Whalebone Whales (*Mystacoceti*) and Toothed Whales (*Odontoceti*). The largest existing species belong to the former group, but in both groups are to be found Whales which are commercially sought.

The Whalebone Whales receive their common name because of the presence of large numbers of laminae, or plates of baleen or "whalebone," which depend into the mouth from the upper jaw. These baleen plates vary greatly in number in the different species, reaching as high as 400 sheets to the side in the Greenland Whale. In length, likewise, there is the greatest variation—in the large commercial whales, ranging from 18 inches up to as much as 15 feet (the latter representing the length of the longest Greenland Whale baleen), while in texture also, as has been seen, there is very great diversity.

The baleen plates, which are relatively very thin, are set regularly close together, but not touching each other, so that a free passage is left between for the water, while the feeding process is going on. The bases of the plates are wide; and from here they taper regularly all the way to the lowermost point. The outer edges of the baleen are more or less straight, and quite smooth; but internally, the fibres of which they are composed are frayed out or frimbiated, so as to present an even hairy surface over the whole of the inside of the upper part of the mouth, except the palate, which is of a beautiful soft smoothness. These frayed-out ends of baleen make an exceedingly efficient hair-sieve, which is used in the manner to be described. First let me point out, however, that the bases of all the baleen plates are set obliquely, so that the inner edge is well ahead of the outer—roughly, as the gills of a fish are set—so as to expedite the passage of water. A study of these shows, in fact, that were they set otherwise, the open mouth of the Whale would be simply a water-trap, forming an obstruction to the passage of the Whale.

The Whalebone Whales all subsist upon the tiniest pelagic organisms.

The Commercial Whales are well represented in the waters of New South Wales; at least six species of Whalebone Whales, and one Toothed Whale, being more or less abundant, and of commercial importance. These are as follows:—

(*a*)—*WHALEBONE WHALES.*

1. Southern Right Whale or Black Whale (*Balaena australis*).
2. Blue Whale or "Sulphurbottom" (*Balaenoptera musculus*).
3. "Finner," Common Finback Whale, or Black Finback (*Balaenoptera physalus*).
4. Pollack Whale, or "Seihval" ("Grey Finback" (*Balaenoptera borealis*).
5. Little Pike Whale, Piked Whale, or "Grampus" (*Balaenoptera acutorostrata*).
6. Humpback Whale (*Megaptera nodosa*).

In addition to these, it is as well to mention that there is in these waters, also, a small mystacocetid known as the Pigmy Right Whale (*Eubalaena marginata*). This is said to rarely exceed a length of 20 feet.

(*b*)—*TOOTHED WHALES.*

Sperm Whale (*Physeter macrocephalus*).

A small and highly interesting ally of this great whale, —known as the Pigmy Sperm Whale (*Kogia breviceps*)— is also worthy of mention, though it is of no commercial importance.

The Southern Right Whale, though the richest as regards blubber, is not very abundant on the east coast of Australia. The most abundant whale is the Humpback, the next numerically in importance being the Black Fin-back and the Blue Whale. The Seihval is also fairly abundant.

The great Sperm Whale, although it occurs in large schools, is not of very frequent occurrence on our coast, except on the southernmost portions.

Of the smaller whale-like animals, the most abundant is the common Dolphin (*Delphinus delphis*).

The greatest of the large whales in our waters is the Blue Whale, which has been captured up to 98 feet in length.

PRODUCTS OF WHALING.

The most important products of whaling may be summed up as under:—

(*a*) Whale-oil.
(*b*) Spermaceti.
(*c*) Ambergris.
(*d*) Baleen or Whalebone.
(*e*) Whale-meat Meal.
(*f*) Whale Guano.
(*g*) Bone Meal.
(*h*) Bone and Ivory.

WHALE-OIL is obtained, in the case of the Whalebone or Baleen Whales, first, from the blubber, and, secondly, the flesh and bones of the carcase; of the latter the oil coming from the tongue and kidney fat, and from the bones of the skull, being of superior quality. In the case of Sperm Whales, there is the fine blubber oil (Sperm oil), and the head, or "case," oil.

SPERMACETI is white and semi-transparent, and of a slightly fatty taste and odor. A fracture of a cake reveals broadly foliated crystallised pieces, suggestive of quartz.

AMBERGRIS.—This curious, comparatively rare, and immensely valuable substance, is obtained usually out of the rectum of the Cachalot, or Sperm Whale. Not infrequently it has been found floating at sea, or else cast up on the shores of lands bordering on the haunts of this great cetacean. Usually obtained in small fragments, some very large pieces have been found. One of the largest of these was taken during the year 1913 by the Whalers connected with the Loch Tay" from the rectum of a large Cachalot in New Zealand waters. This was a somewhat pear-shaped piece, which weighed no less than 160 kilogrammes (352 lb.)! This was sold in London for about £12,000 sterling.

It is usually considered that the presence of Ambergris is a sign of sickness in the Whale, and that its secretion is caused possibly by a biliary irritation.

BALEEN OR WHALEBONE.—This is that substance which gives the name to the so-called "Whalebone" Whales, as distinguished from the "Toothed" Whales. The Whalebone Whales do not possess teeth (except, in certain cases, in their foetal condition).

WHALE-MEAT MEAL.—This is a dried meal, made exclusively from absolutely fresh Whale-meat; and picked from certain portions (like the tail end in the Fin-back Whale), which are very free from oil. This is a highly nutritious foodstuff, containing (according to Salvesen) about 79 per cent. of protein.

WHALE GUANO.—This product is generally made from the flesh of the carcase, with the addition of about one-third of the bony matter. It is said that an analysis of this shows nitrogen equivalent to about 8.50 per cent. of ammonia, and phosphoric acid equivalent to about 21 per cent. of tri-basic phosphate of lime. A guano is also made from the refuse of the whole carcase, including all the bony matter. This makes a valuable fertiliser, said to contain the equivalent of from about 10 to 11.75 per cent. of ammonia and 17 to 23 per cent. of phosphate of lime.

BONE MEAL.—This may be made either from the "green" bones or from bones which have passed through the digester (pressure boiler).

WHALE BEEF.—Perhaps the most important of the modern products of whales is that of the fresh and canned Whale Beef. A large business is now growing up in various parts of the world, and efforts are at present being made to extend this to Australia.

One of the most picturesque of sea-monsters is a member of the whale kind, this being the Killer, or Killer Whale (*Orca gladiator*), which attains a length of about 30 feet. It is one of the Toothed Whales, having large conical teeth in both jaws. It is mostly known on this coast through its connection with a very small Whaling Industry on the coast of New South Wales at Eden.

AN INTERESTING SEA-SHORE FLY.

By Thos. Steel, F.L.S.

While stopping at Wollongong during March last I noticed an enormous congregation of the fly which occurs commonly on the ocean beach, flying briskly for a few yards when one is walking near the water's edge and lighting again on the sand. The flies were collected in a slight depression on a cliff of friable rock beside the North Wollongong surf beach.. There must have been many thousands of them, forming a coating which quite hid the rock on a surface of several yards square, giving the place the appearance from a little distance of being painted with tar. The flies furthest in at the back of the cavity were in a double layer. They were not pairing, and I am quite at a loss to account for their gathering in this way. They rose in clouds when approached. I went daily to the spot for over a week, and on some days found the place deserted, while on others perhaps a dozen flies were there, and again a multitude, as I have described. The weather was pleasant and warm during the whole time. Large numbers of dead flies lay on the ground beneath, which were washed away at high tide. On the days when the flies were not crowded, single lines from a few inches to several feet in length of dead flies were sticking to the rock surface, just as if they had adhered to something exuding from microscopic cracks, but examination with the lens failed to disclose any cracks. A few isolated patches of flies occurred on "crowded" days in slight depressions about the face of the rocks, and on one occasion I noticed a crowded patch of flies on an exposed concrete wall abutting on the beach, at a place stained by water running down, but which was quite dry at the time. I collected specimens and forwarded them to Dr. Tillyard, who has kindly given me the following note regarding them:—

"I must thank you for your very interesting letter, and the small packet of flies just to hand.

"I know this fly well, as a frequenter of the sea-shore, but I have never seen it so abundantly as you describe. It is almost certainly undescribed, and I doubt if there is anybody in Australia competent to deal with it, as it belongs to the great group of the *Muscidae Acalyptratae*, which now contains more than fifty families, all of them distinguished by characters that require the handling of a specialist. Even to put it into its correct family, it would be necessary to have very perfectly preserved specimens, with the antennae, tarsal joints and the fine setae of the head and thorax intact. Your specimens being sent dry, have all lost the terminal arista and some of the setae. Thus I cannot place it definitely in any family for you; but I think it probably belongs to the *Ochthyphilidae*, or "bank-lovers," which are mostly to be found on the banks of rivers and along the sea-shore. Probably its larva is a kelp-feeder, and your large concourse of flies may have been due to a local plethora of successful larvae that had been feeding on some local accumulation of old seaweed, possibly buried or hidden near the rocks you saw them on. Flies of this sort are quite fond of basking on rocks, sand, sea-weed, etc.''

I can only add to what Dr. Tillyard says that there is exceedingly little kelp lying about the Wollongong beaches at the place where I saw the flies; the caretaker gathers up and removes it regularly. I did not ask what was done with the kelp, and it is quite probable that it may be buried, as Dr. Tillyard suggests, in which case it might form an ideal incubation place for the flies. Specimens of such flies should be preserved while alive, preferably in the field, in 70 per cent. methylated spirit.

TRACKS OF GARDEN SNAIL.*

By Thos. Steel, F.L.S.

In the *Victorian Naturalist*, XXXIV., p. 171, Professor Sir Baldwin Spencer asks for information regarding the track left by the common introduced garden snail, *Helix aspera*, which is in the form of a series of short, thick, detached lines or patches. I have made a number of observations on the subject, and think I have arrived at the correct explanation.

The mucus which forms the track appears to be discharged intermittingly from the orifice of the large mucus gland near the anterior end of the ventral surface, and its purpose is to serve as a lubricant for the smooth passage of the animal's body. As the animal moves forward the mucus is thus deposited in isolated portions, with the result that on a rough surface, such as asphalt, most of the mucus remains where deposited, and is not spread forward to any extent. On a smooth surface, such as glass, the mucus is carried forward, through the animal's ambulacral surface being in close contact with the glass, and so a continuous trail is formed. When snails crawl on rough surfaces, such as asphalt, wood, or a hard earth footpath, the mucus is frequently carried across from one deposit to another in the form either of a thin film or a mere thread, thus forming a series of connections or bridges between successive discharges.

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* *Victorian Naturalist*, XXXV., p. 91.

Snails crawling on plain brown linoleum leave a very clear intermittent trail, the waxy surface of the linoleum not lending itself to the spreading of the mucus as glass does; and thus tending to preserve intact the separate deposits. When a snail is crawling on glass the muscular motion of its foot or sole is very clearly seen from beneath, passing forward in a series of simultaneous waves like those seen in the legs of a crawling myriapod. The tracks of slugs, *Limax*, etc., closely resemble those of snails, but on a smaller scale, and the bridging from one deposit to another, on rough surfaces, is usually more complete.

Both snails and slugs secrete two kinds of mucus, apart from that secreted by the genital gland. That forming the track is, as has been mentioned, the product of the large ventral mucus gland. In both cases it is a clear, glairy, very tenacious substance. When the animal is crawling quietly, without being disturbed, the mucus is quite translucent, and under the microscope shows only a few scattered rounded cells and some nucleated cells, which I suppose to be epithelium cells. As a distinctive term, I would propose to call this secretion the ambulacral mucus. On the other hand, the secretion coating the dorsal surface, both of snails and slugs, and which may perhaps best be distinguished by terming it dermal mucus, is turbid, and when examined microcopically is seen to be densely crowded with minute structurless granules or cells of varying dimensions, mostly sausage-shaped, and reminding one of a crowd of diatoms. When the animal is irritated, by touching or in other ways, the secretion is poured out abundantly. It is the product of numerous epidermal glands, resembling those described by Dr. A. Dendy in his description of the anatomy of a land planarian, Trans. Royal Soc., Victoria, 1899 (See also *Outlines of Zoology*, by J. Arthur Thomson, 1892 edition, pp. 319, 321).

Sometimes, particularly when the animal is disturbed when crawling, the mucus of the track contains portions of the dermal mucus trailed off as the snail moves along. The ambulacral mucus is frequently stained with streaks of yellow or green, through contamination with excrement. Snail mucus is not coagulated by boiling water, but is coagulated through dehydration, by alcohol. I have used the term "mucus" in referring to these secretions because I think it is a better term than slime, which is sometimes used, and besides, in text-books, the large ventral gland is usually known as the mucus gland.

It may here be mentioned that in *Proc. Linn. Socy., New South Wales*, 1915, p. 114, there is an illustrated paper by the present writer describing the feeding tracks of *Limax maximus.*

PRESERVATION OF NATURAL HISTORY SPECIMENS.

By Thos. Steel, F.L.S.

Many natural history specimens belonging to a wide range can be admirably preserved in a dry state with surprisingly little distortion through shrinkage, by merely soaking for a sufficient time in dilute formaline and hanging up to dry. In this way I have quite satisfactorily treated snakes, lizards, molluscs such as chitons, also birds and small mammals. If a little strong formaline is injected by means of a glass syringe or a piece of glass tubing into the anus and down the throat of the vertebrates, it will assist in the thoroughness of the treatment. The whole object is then submerged completely in plenty of dilute formaline, about 3 or 4 per cent. (say, 1½ fluid ounce strong formaline to 1 quart water), and left to soak for about a month. It is then taken out and hung up or laid aside to dry. If desired, the specimen can be set or tied in any desired attitude before soaking.

RECENT LITERATURE.

Trap-door Spiders.—A recent number (XIII., No. 7) of the *Records, Australian Museum,* is devoted to an account of Australian Trap-door Spiders, by Mr. Rainbow and Dr. Pulleine. In this paper there is brought together a quantity of most interesting information on a subject about which few of us are well informed. The paper is a valuable one, and contains descriptions of numerous hitherto undescribed spiders belonging to the group dealt with. It is illustrated with plates of the spiders and their nests. The plates, from photographs, taken by Dr. Pulleine, of the nests, are excellent, but one at least of those illustrating the spiders themselves, taken from spirit specimens, might have been dispensed with. Particularly interesting are the notes on the habits of the animals, and more information about these would have been welcome. No indication is given as to where the type specimens are preserved. This is a matter of importance to naturalists, and should always be clearly stated.—Ed.

SHEEP MAGGOT FLIES.—A very important bulletin (Farmer's Bulletin, No. 122) on the above, prepared by Mr. W. W. Froggatt, F.L.S., and Mr. J. L. Froggatt, B.Sc., has been issued by the New South Wales Department of Agriculture. In this publication the Messrs. Froggatt give in a concise and clear form the practical results of their experiments and observations on the destruction of the Sheep-maggot Fly, a detestable insect that has been the cause of the loss of enormous sums of money to our sheep-breeders, to say nothing of the terrible suffering inflicted on the unfortunate sheep. The directions given for the construction and working of cheap and effective traps, and for other practical methods of destroying the pests, are admirably clear, and with this bulletin before him no intelligent sheep-breeder will have the slightest hesitation or difficulty in applying the methods prescribed. We strongly commend the publication, not only to sheep-breeders, but to householders generally, who are troubled with blowflies coming about their dwellings. Copies may be obtained free on application to the Under Secretary, Department of Agriculture, Sydney.—Ed.

NOTES AND COMMENTS.

STRENGTH OF ANTS.—In the *Aust. Nat.*, Vol. ii., p. 177, I give an account of the relative weights of ants (*Camponotus forcipes*), and of the loads which they were dragging. Recently at Pennant Hills I noticed one of the mound-forming ants (*Iridomyrmex sanguinus*) dragging a fish-bone along a smooth brick footpath. It was as much as the ant could do, moving backwards, to drag the bone along. The bone was of such a shape as to present the least resistance, as it had a couple of sharp edges, which acted like skates, while the ant was able to get a firm grip its jaws. The weight of the ant was .0045, and of the bone .2414 gram., so the load was just 54 times the weight of the ant. I also saw another ant of same species and weight running along quite rapidly, dragging a dead bee, which weighed .088 gram., or just 19½ times its own weight.

THOS. STEEL.

The Australian Naturalist

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

10th June, 1919.—Mr. W. W. Froggatt in the chair, and 34 present. An apology for absence was received from the President. The following were elected members: Miss F. C. Hutton, Rev. J. Thomas, Messrs. W. A. Miller and J. Hopson, jun.

The Chairman announced that Mr. T. Steel, F.L.S., had presented a large number of valuable books on natural history subjects to the library.

The following papers were read: Mr. Froggatt, "On a Parasite of the Red-backed Spider" and "Re-discovery of a Saw Fly." The Rev. Archdeacon Haviland, "The Stomata of the Leafless Plants of the Interior." Mr. A. A. Hamilton, "Abnormal Branching of a Palm." Miss A. Brewster, "Germination of the Choko Seed." Mr. T. Steel, "An Old British Herbal." Miss Busby, "A Trip to Gosford."

Mr. Hugh Dixson sent for exhibition scales of the so-called "Nile Salmon," an edible fish from the River Nile. On these Mr. D. G. Stead furnishes the following note:—"The scales, which are cycloid, appear to me to be those of one of the Cyprinoids, closely related to the Barbel. There is a number of Carp-like fishes of the Barbel group in these waters, and without additional data I cannot make the identification more specific."

Mr. W. W. Froggatt exhibited a series of specimens of destructive insects, comprising the "White Grub Beetle" *(Scitala pruinosa)*, the larvae of which have been doing much damage to grass roots at the Leura and Blackheath golf links, and in vegetable gardens about Sydney. The Lantana Fly *(Agromyza sp.)*, the grub of which has been found by Messrs. Bryce and

Barnett in the berries of *Lantana* growing about Sydney. This insect is probably closely allied or identical with *A lantanæ*, which has proved very useful in checking the spread of this noxious plant in Hawaii. The plant has found its way to New Caledonia., Fiji, Queensland, and is abundant about Sydney. It is hoped that the fly will be able to restrict the spread of the Lantana in these places also.

A Braconid parasite of the Powder Post Beetle *(Lystus brunneus)*, the well-known destructive furniture beetle. This is the first record known to the exhibitor of a parasite on this beetle.

Living specimens of a small Sawfly *(Eurys Sp.)* common on rushes and grass at Moree (N.S.W.).

Living examples of a Chalcid wasp *(Dirrhinus Sp.)*, probably undescribed, parasitic upon the pupa of the Flesh Fly *(Sarcophaga aurifrons)*. This curious little wasp has the head deeply cleft in the centre and remarkable spiny swollen hind legs.

Specimens of the spider-egg parasite, described in his paper and of the rare Saw Fly *(Pterygophorus bifaciatus)* illustrating his notes, were also exhibited.

Denisonia decorata, a venomous snake common at Moree.

In the discussion which followed the reading of Miss Brewster's paper on the Choko, a question was asked regarding variability in the successful germination of the seeds. Miss Brewster replied that she had been told that germination was more certain if the fruits were left until they dropped from the vine. Mr. A. G. Hamilton also supported this view. Other members had had no trouble with the growth of seeds gathered and planted. Mr. Gallard said he left the fruit on the vine until large shoots developed and was quite successful with them.

Mr. Finckh exhibited nodules of ironstone and asked Miss Brewster for an explanation of the cause of the peculiar formation. Miss Brewster replied that Professor David had described how the Hawkesbury sandstone and Wianamatta shale (especially the latter) contain as a marked feature oxide of iron in the form of segregations, veins and nodules. The sandstone is traversed by numerous joints which are frequently filled with hydrated peroxide of iron derived from the decomposition of scattered pyrites crystals. These masses or nodules, through weathering, frequently assume the form of concentric shells of varying shades of iron oxide and producing characteristic features in the superficial structure of the Blue Mountain plateau.

ANNUAL MEETING.

5th August, 1919.—The President, Mr. F. W. Carpenter, M.A., occupied the chair, and about 90 were present. The office-bearers, as set out in the list printed on inside cover, were duly elected.

The President delivered his annual address, taking as his subject, "The Scientific Study of Scenery," with special reference to the Grand Canyon, Blackheath. The address was illustrated with a very fine series of lantern slides from photographs taken by the lecturer, showing clearly how this canyon was formed by erosion by water acting on the jointed sandstone. Special attention was drawn to the presence in the canyon of a volcanic dyke, which, yielding to the action of the water, had altered the direction of the original watercourse. The lecture was extremely instructive and interesting, and opened up quite a new aspect of the subject to most members present. On the motion of Messrs. Waterhouse and Froggatt, the President was accorded a cordial vote of thanks for his very able address.

ANNUAL REPORT OF COUNCIL.

The past year has been one of considerable disappointment owing to the inability to hold meetings through Government regulations arising out of the visitation of pneumonic influenza. Only three meetings were held, those in October and November, 1918, and June, 1919. These were very well attended, and considering the want of continuity, the June meeting evidenced unabated interest in the Society's work. Only two lectures were delivered, one by Mr. Cheel, on "A

Naturalist's Visit to Fiji," and one by Mr. A. G. Hamilton, on "Pollination of Australian Flowers." The Council desires to record its thanks to these gentlemen. Our excursions have also been few, but we are much indebted to the leaders on these occasions. Our thanks are also due to Mr. White, Hon. Lanternist, for his services, and to the Minister for Education and the Director of Education for the use of the hall in the Education Buildings for our meetings.

The following members of the Society have returned from active service: Lieutenant Hamblin, Lieutenant Goldfinch, and Lieutenant Carne; and we accord to them our cordial congratulations and admiration.

We regret the early departure for England of our President, Mr. F. W. Carpenter, M.A., whose enthusiasm and able assistance we shall greatly miss. We wish him a happy and prosperous future in his new sphere of work.

The Council records with deep thanks the gift of a very valuable collection of scientific books from Mr. T. Steel, F.L.S., Hon. Editor. Now that the war is over and we are gradually returning to more normal conditions of life, we look hopefully forward to a successful year's work.

E. S. EDWARDS, Hon. Secretary.

RECENT LITERATURE.

The last issue of *Records Australian Museum* (Vol. XII., No. 10) is in the main devoted to an illustrated account of the Australian Fishes of the family *Gobidæ*, by Messrs. A. R. McCulloch and J. D. Ogilby. The letterpress is purely technical, but we would like to draw attention to the beauty and fidelity of the plates, which number seven in all. These exquisite plates are from drawings by Miss Phyllis Clarke, and are quite up to the usual standard of that gifted artist. They reflect the greatest credit upon her, and on the printers who have reproduced them. The museum is to be congratulated on maintaining so high a standard of excellence in its publications.—Ed.

PLANTAGO IN MEDICINE.

By Thos. Steel, F.L.S.

The following note was sent in by Miss Manning, the plant being identified by Mr. A. A. Hamilton, as an introduced *Plantago*, but too imperfect for specific determination:

> Quite recently a weed, Planta, was brought under my notice, being used to cure a poisoned wound. The youngest child in the house where I was staying developed a poisoned toe, and as it was troublesome to poultice, his mother remembered the weed, and as I was most anxious to see the effect, she applied a leaf morning and evening for two days, when the wound was quite clean and only needed protecting. Later on an elder girl with a nasty wound on the calf of her leg caused by a rusty nail had also the planta leaf applied for two or three days, and the same cure effected. The aboriginals had a way of stripping off the slightly hairy surface of the leaf before applying to the wound, but as this had not been shown to my friend, the method used was, after leaving the leaf wither for a few hours, roll it tightly upon itself upper side in, then rub vigorously between the palms. On opening it out a somewhat sticky substance exudes which helps to glue it to the affected part.
>
> The planta weed is a very pale green, somewhat fleshy, and varies from two to five inches across, somewhat like the dock.

The aboriginals used the leaves of a number of different indigenous plants for the treatment of wounds, and if this plant, as Mr. Hamilton says, is an exotic, it would be most interesting if they have adopted its use All the European plantagos have more or less ribbed leaves, and amongst these *P. major* is the species to which medicinal properties are usually ascribed. *P. major* has large fleshy leaves bearing a distinct resemblance to those of the dock. It is found in moist sheltered places in many localities throughout this State; thus I saw it growing luxuriantly a few weeks ago at Condong and Cudgen, on the Tweed River, and since then also at Wollongong. In this connection it is interesting to note that the seeds of *P. ovata* and *P. ispaghula* are largely used in India and elsewhere as demulcents, much as linseed and barley are also used. The seeds of the former species are included in the Pharmacopoeia of India.

The plaintain has had a reputation for medicinal virtues from very early times. Pliny, for instance, attributes quite remarkable healing powers to this plant, while in the old English herbals references are frequent. A plantago was known to the Greeks, from the shape of the leaf, as *armoglossan* or "lamb's tongue," by which name it is also widely known in rural England, the fondness of sheep for this herb being also proverbial.

An old English herbal writer, Gervaise Markham, 1568-1637, recommends a decoction of plantains, Knotgrass, and other herbs, for the treatment of what he calls "broken joynts." So eminent a man as Robert Boyle, in his work "Medicinal Experiments," 1718, gives a recipe consisting of the entire plant of "Rose-plantane" *(P. media)* chopped with butter, as a cure for madness in dogs. The flowerhead of the common Rib-herb, *P. lanceolata*, was widely used in England as a diviner of love secrets, somewhat after the same manner as the seed heads of the dandelion.

The North American Indians called the same plant "White man's foot," because it sprang up wherever the white man settled. Longfellow, in "The Song of Hiawatha," introduces this association:—

> Wheresoe'er they tread, beneath them
> Springs a flower unknown among us,
> Springs the White Man's Foot in blossom.

The following references by Shakespeare confirm the healing reputation of the herb "Love's Labour Lost," (act 3, sc. 1):

> Here's a Costard broken in a shin,
> O, sir, plantain, a plain plantain;
> No *l'envoy*, no *l'envoy;* no salve, sir, but a plain plantain.

And in "Romeo and Juliet," (act 1, sc. 2)—

> Rom.: Your plantain leaf is excellent for that.
> Ben.: For what, I pray thee?
> Rom.: For your broken shin.

The English poet W. Shenstone (1714-1763) writes of—

"The plantain ribbed that heals the reaper's wound." The flower heads of *P. lanceolata* are very widely known amongst children as "soldiers," &c., and are used in a game in which the heads are struck against one another to knock them off the stalks. The Germans call them "Tuefelskopf or "devil's head." The plant itself is known in Germany as "Wegerich" or "the watcher," there being an old legend to the effect that it first sprung up on the spot where the Lady Ermentrude waited in vain till she died, for the return of her husband, Sir Hildebrand, who had been slain in combat.

This legend is very sweetly commemorated by one of our English poets:—

"The summer comes, the summer glows,
The autumn wanes, the autumn goes;
The plantain by the wayside blows,
Watcher of the roadway."

Other plants besides the plantain enjoy a wide reputation for healing wounds and sores. Scores of them are mentioned in all the old herbals, but in my own experience I have found but few of these in actual use at the present day. A few may be mentioned. In Europe the leaves of the common dock *(Rumex crispus)* are rubbed on as an antidote to the sting of the nettle, while in Australia those of the Cunjevoi *(Calocasia macrorrhiza)* are used for a similar purpose in the case of the stinging tree. I have known the leaves of both the Cunjevoi and the above introduced dock to be used in Australia for the same purpose as those of the plantain as described above by Miss Manning. Since the above was written I have received additional evidence of the popularity of *P. major* as a healing plant. A neighbour of mine at Pennant Hills procured plants which are now growing in his garden, for the purpose of providing a supply of the leaves for his wife, who has told me she has found them highly beneficial when gently heated and applied to obstinate sores.

THE STOMATA OF THE LEAFLESS PLANTS OF THE INTERIOR.

By Archdeacon F. E. Haviland.

The species I propose to treat of are well defined leafless plants growing over the western plains of New South Wales. They afford wonderful evidence as to how nature adapts herself to altered conditions. A question which in a general way suggests itself is whether, such plants are destined to become clothed with foliage, or whether they had been so clothed in their ancestral state.

There is, at least, one witness in favour of the latter supposition, and this is afforded in the shrub *Apophyllum anomalum*. In a luxuriant spring this shrub actually develops a few leaves which lie closely to the branches, and almost adnate; but, in a very short time, say a few weeks, it sheds them, even when some are only yet half developed. Such a condition of things points to a lost habit.

The Conifers may also be mentioned, though I do not, myself, consider the Pines to be leafless plants, they having, to all intents what may be safely regarded as leaves, the so-called "scale leaves," bearing stomata (and therefore I am not including them in this paper), whatever they may in the future become; these show a morphologically degenerating tendency. *Bossiaea Walkeri* with its dilated leaf stems and undeveloped leaf-buds, is another instance of a lost foliage.

Such cases point to the fact that these plants, in their efforts to survive the conditions which cost them their foliage, have had to adapt their branches and stems to foliage functions. Now this is effected by means adopted in the ordinary way by true leaves of other plants—i.e., by the assistance of stomata developed upon the leaf-like epidermis of the branches where the chlorophyll is also secreted.

In referring to the stomata as they occur in such varied numbers in different places on the same plant, and in such varied proportions comparatively as to others, one gets an idea of the breathing powers of the various plants so circumstanced. As a rule, where the stomata are very minute they are more numerous, and vice versa; so that there is a tendency to equalise the average powers of transpiration in various plants. In the following species the number of stomata to the square inch, have been calculated on a basis of the average of five reckonings in different parts of the epidermis. *Apophyllum anomalum* FvM "Warrior Bush.": The stomata on the branches of this shrub are broad, oval in outline, and raised above the surface. They are very small and very numerous, as many as 63,800 to the square inch. On the caducous leaves which sometimes appear in the spring, they are more numerous, running up to 75,000 to the square inch, and each one crowned with an unicellular hair, which does not occur on those of the branches. These hairs have apparently no orifice for the ingress and egress of gases. Probably this strange circumstance is sufficient to account for the early shedding of the leaves, and their deformity. The guard cells of both classes of stomata are irregularly oriented.

Exocarpus aphylla RBr.: This is a sister plant to the "Wild Cherry." The internodes are very short in this shrub, and the stomata are inserted within the very narrow grooves which run longitudinally, and these grooves are protected by crowded hairs from the changes of weather and from too rapid a transpiration through the stomata. The stomata are difficult to locate, being concealed amongst the dense hairs.

Templetonia egena, Benth: The epidermis of the branches of this shrub is comprised of bands, one half millimetre broad, each alternate one bearing stomata. The guard cells are elliptical in shape when closed, and circular when opened; they lie irregularly oriented. Frequently the stomata are in pairs, and they number 58,750 to the square inch. Each stoma is surrounded by a circlet of wedge-shaped subsidiary cells, and appears to have a slitted membrane opening along the meridian.

Casuarina, sp.: Not having obtained the fruits of this species I am unable to identify it, but I presume there would be little difference as to the morphology of the stomata. The internodes are comprised of bands of various widths alternating with grooves, which in cross section appear of the shape of indian clubs; they measure 0.25 deep and 0.06 mm. wide. The stomata are placed along the sides of the grooves, which, as in other cases, are clogged with short, thick hairs, and are oriented at right angles to the grooves. The guard cells are elliptical, and intruded at each end with minute wedge-like processes, thus reducing the stomata to very minute oblong openings 0.01 x 0.05 mm. which run in series of twos.

Sarcostemma australe, RBr.: "Caustic Vine." In this trailer the guard cells are oriented longitudinally with the stems, are well spaced, and very large, being

0.06 mm. long and 0.04 wide; they are surrounded with a collarette of square subsidiary cells, and the stomata number 16,250 to the square inch; the low average accounting for the largeness of the stomata.

Bossiaea Walkeri, FvM: "Stick Bush," "Sun Bush." The dilated stems of the bush appear in section like a two-edged sword, and are crowded with very minute stomata which run up to 67,500 to the square inch. They are surrounded with curved subsidiaries and sunk below the surface. The regularity with which they are placed resembles the planting of an orchard, and all are oriented.

The effort of leaf development in this plant does not get beyond minute leaf-buds, which occur regularly on the edges of the branches.

These leafless plants impart a very remarkable appearance to the plains, as well as being peculiar as to their aspect; some branches, as those of the *Apophyllum*, stand erect like inverted brooms, while those of the *Exocarpus aphylla* are in divaricate, brittle angles, and others of the *Casuarina* making vain attempts to sweep the ground with their pendent and whistling beards; then those of the *Sarcostemma* run in a wild, meaningless manner over the rocks and old stumps, as if these needed binding down to the earth.

Doubtless, it is mainly owing to the frequent occurrences of such sights that the West bears to an unaccustomed eye, such a weird aspect; and yet it has a fascination that the longer residents have learned to love.

In the discussion which followed the reading of Archdeacon Haviland's paper, surprise was expressed that plants growing in such conditions should have exposed stomata, seeing that xerophilous plants generally have these organs protected. Mr. A. G. Hamilton pointed out that in some of the Hakeas the stomata, while seemingly exposed, are really effectually concealed, being situated at the bottom of a depression which is covered by a little raised hood of epidermal cells. He thought that this might probably be the case with the stomata mentioned in the paper.

GEOLOGICAL EXCURSION TO BONDI.

June 14th, 1919.

Leader: Miss A. Brewster.

The following is a summary of the more important points demonstrated:—

1. The bay shows an attack by erosion along a line of weakness.

2. Inter-bedded shale is exposed in the tramway cutting just before the beach is reached.

3. The headlands being more resistant, are less attacked.

4. The beaches composed of worn-down material carried by streams and spread out by wave action.

5. Ripple marks on the sand and structure of sand dunes indicating direction of prevailing winds.

6. The retarding action on sand movement of the *Spinifex* and other binders, and further back the plants acting as sand retainers.

7. Note sandstone consisting chiefly of grains of quartz coated with tiny crystals of secondary quartz, giving them a glistening appearance. Oxide of iron and minute crystals of iron pyrites are also present, and in some beds decomposing felspar and small particles of graphite.

8. Grits and conglomerates containing numerous pebbles of milky or reef quartz. These and the quartz sandstone grains show that the beds were formed originally from igneous rocks such as granite.

9. Note vertical joints in the cliffs with resulting clean-cut faces. These and the bedding planes constitute lines of weakness to weathering action.

10. The false and current bedding in the cliffs suggest shallow water conditions when the beds were laid down.

11. Prominent dyke fissures, one running N. and S. the others E. and W. The N. and S. dyke cuts right across the cliffs, and, being the means of attack from behind, dooms the present cliff face. The E. and W. dykes form little inlets, and have a marked effect on the local coast contour.

12. The decomposed basalt in one of the fissures consists of Kaolin or white clay.

13. The columnar sandstone constitutes an interesting feature, alongside of which are reddish outcrops of weathered basalt.

14. The difference in the style of weathering between basalt and sandstone are well displayed where patches of these rocks are exposed to the action of the sea.

15. Contorted false bedding of sandstone is thought to be due to ice action when the beds were ill consolidated.

16. Reference to a geological map shows that South and North Heads are tombolas or tied islands.

THE RE-DISCOVERY OF A SAW-FLY.

By Walter W. Froggatt.

In his "Natural History of Insects," Brulle described a new Australian Saw-fly (*Pterogophorus bifasciatus*) from Tasmania in 1846. It was a unique type, and was unknown in all collections of Australian Hymenoptera.

About two years ago, Master Harold Brooks sending me some entomological specimens from Dungog, Tweed River (N.S. Wales), included a section of wood full of cocoons, which on examination proved to contain pupal Saw-flies. Later on a fine series of very handsome little Saw-flies with blotched wings, new to me, were bred out.

Considering it a new species, I sent it with other insects to the British Museum, to my friend Mr. Roland E. Turner. The ship containing the package (which fortunately was enclosed in a thick tin covering box), was torpedoed in the British Channel, but the mails were saved, and finally the package was delivered at the British Museum. Though soaked with sea water, the little Saw-fly was intact.

On examination, this proved to be identical with Brulle's long-unknown species described 72 years ago from Tasmania.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

2nd September, 1919.—At the Education Department, the president, Miss Le Plastrier, in the chair, and about 44 present. The president announced that Dr. J. B. Cleland had been elected to the Council in place of Mr. Carpenter, resigned.

A paper by Mr. Oliver Edwards:—"On the Birds Seen at Goorianawa Station in the month of August, 1919," was read by Mr. E. G. Edwards. This paper gave many interesting observations on the habits of the birds, and showed Mr. Edwards to be a keen and accurate observer.

Mr. A. A. Hamilton contributed a paper:—"Root Fasciation in Cycads."

Miss A. A. Brewster read a valuable paper on:—"Dawsonia polytrichoides."

2nd October, 1919.—At Education Department, the president, Miss Le Plastrier, presiding, and about 25 present.

The following were duly elected members:—Misses Whealan, Mabel Roseby, Mary Roseby, H. Drummond, Fuller, Messrs. Barnett, Walsh, and C. Gaggin.

Mr. Froggatt exhibited specimens of rust galls which are proving very destructive to Currajong trees. Mr. L. Gallard, life history of the common green cicada (*Cyclochila australasiae*), also three blind snakes (*Typhlops*) found in termites' nests. Mr. A. A. Hamilton, an example of fasciation in Actinotus. Mr. W. M. Carne showed specimens of some plants and illustrations of others seen by him in Palestine and referred to in Scripture.

Mr. G. A. Waterhouse delivered a lucid address on Butterflies and their collection.

Miss A. A. Brewster gave an address on:—"Macrozamia or Burrawang," illustrated with diagrams.

4th November, 1919.—At Education Building, the president, Miss Le Plastrier, in the chair, and about 35 present.

Miss Mabel Brewster exhibited leaves cut by leaf-cutting bees, from Clarence, Blue Mountains.

Miss A. A. Brewster, roots of mangrove with explanatory remarks. Miss Drummond, *Marchantia* successfully grown in a tin. The President, *Xanthorea minor,* showing fasciation, grown on sandstone close to Wainamatta shale.

Mr. A. A. Hamilton gave a most capable address on "Ecology of Salt Marshes." This is a subject of which Mr. Hamilton has made a special study, and his remarks were most lucid and interesting, showing what a vast field for observation lies in subjects of this class.

2nd December, 1919.—The president Miss C. Le Plastrier, in the chair, and 32 members present. A letter was received from Mr. A. H. S. Lucas returning thanks for a vote of sympathy from the society on the death of his wife.

The President announced the death of Mr. W. J. Rainbow, F.E.S., and it was resolved that a letter of sympathy be sent to his sons. Appreciative references to the life and work of Mr. Rainbow were made by Mr. G. A. Waterhouse, B.Sc., F.E.S., and other members.

Reference was made to the resignation, by Mr. E. S. Edwards, M.A., of the position of Hon. Secretary to the Society, which the Council had regretfully accepted. It was unanimously resolved that a letter be written to Mr. Edwards thanking him for his valuable services to the Society. It was announced that Mr. A. A. Hamilton had taken up the duties of Hon. Secretary.

Miss Harris and Mr. Stirling were elected members of the Society.

Miss Drummond exhibited a fine series of fossils from Portland. Mr. E. Cheel offered some remarks on a tomato affected with leaf-spot disease, brought under notice by Miss McAnene. Mr, L. Gallard, an interesting beetle and larva, probably a Eucnemid. Mr. G. A. Waterhouse, the larvæ and pupæ of *Xenica acantha* and *X. Klugi,* and drew attention to the similarity of the pupæ, while the larvæ were easily distinguishable; the larva of former having a brown head with two projecting horns, the head of *X. Klugi* being green and hirsute without horns.

Mr. W. M. Carne, specimen of the Turnsole Dye Plant (*Cryzophora tinctoria*) collected by him in Palestine. Cultivated in France for its purple dye, which is used in Holland for colouring the exterior of cheeses. The purple colour changes to red under the action of acids in the cheeses.

Miss A. A. Brewster exhibited (with note) galls of *Apiomorpha duplex* from Homebush Bay. The life history of the insects at various stages was depicted in a series of excellent drawings. An interesting discussion on the Cultivation and Protection of the Native Flora was opened by Mr. E. Cheel, followed by Mr. W. M. Carne, Mr. Luke Gallard, and other members. Mr. A. C. Duckworth gave a list of native plants successfully transplanted, with notes on the methods adopted.

PRESIDENTIAL ADDRESS, AUGUST, 1919.
THE SCIENTIFIC STUDY OF SCENERY.

With Particular Reference to The Grand Canyon, Blackheath.

By F. W. Carpenter, M.A.

This address was planned as a lantern lecture arranged so that the photographs might tell their own story. Possibly the following notes written at sea, away from my photographs and even my field note-book, may be of value to those who can visit the Canyon.

The photographs were selected to prove that the Grand Canyon was eroded by water action, similar in kind to that which is still going on after every rainstorm; quite unaided by the
sary. A diagram was shown of block faulting—a well-known and well-accepted explanation of a few of the great river valleys of the world; but it is necessary to add that these fault riven valleys are on a scale far exceeding the valley which we are discussing, especially in the matter of breadth.

The notable features of the Blue Mountains are the flatness of the mountain top, and the precipitous nature of the walls of the numerous gullies. The geological map shows that the Mountains are a highly dissected plateau; which owes its flatness, both to the horizontal nature of the strata of which it is composed, and to the fact that it had been denuded to a plain before the great uplift that gave it its present level. The view from Evans' Lookout shows these features clearly. The long stretch of vertical cliff of Hawkesbury sandstone is capped by a bed of
more cataclasmic agencies which so many laymen think neces-
exceptional hardness, which shows jointing on a most massive

scale. This jointing is quite different from faulting, as there is no displacement along the joint plane, and as it is generally a result of intense pressure there is no separation even in the case of a master joint. Below the vertical cliffs is a gently sloping hillside well covered with trees. It is really a scree heap which is renewed more rapidly than the fragments can be carried away by stream action, and is a testimonial to the instability of the massive cliff formation. The cause of this instability will appear later, when we examine the few thin beds of soft shaly character at the bottom of the Canyon.

The track down to the Canyon follows the direction of a small tributary stream, after an initial steep drop, whereby we descend through a very hard rock stratum, taking advantage of the widening of a master joint by atmospheric denudation. The walls of the gap show complex patterns standing out in bold relief, indicating highly mineralised sandstone from which the portions with softer cementing material have been fretted away by wind and rain. Excellent examples of rock sculpture on a grander scale can be found below this level in a little to the left of the track. A further drop brings us to the lower reaches of the creek, and as the volume of water is now restricted on account of a greatly reduced catchment area, the valley has enough soil of a clayey character to secure an excellent growth of ferns and tree-ferns. That erosion is still in progress, however, is evident from the exposure of great root masses.

In a short time we reach the Canyon itself. A track downstream leading to the Beauchamp Falls is well worth following, as the Canyon becomes very narrow and the perpendicular walls tower upwards to a maximum height. Near the Falls we can read the secret of these vertical walls. In spite of their thousand feet of hard sandstone they have "feet of clay" (or shale), and this thin bed of Narrabeen shale is at the same level as the top of the scree-heap mentioned before.

However, most of our story will be best unfolded by a walk upstream. A little above the junction the water appears to flow from under a great mass of solid rock; but closer examination shows that this rock is a fragment fallen from above, and that the stream is slowly but successfully removing an obstacle, which has blocked its flow for many generations. Further upstream we shall find many of these massive fragments, some as large as a cottage, which have fallen from the very top of the cliffs and form more or less "temporary stoppings." The epiphytic growths on these rocks, and the presence of large trees growing in the debris, show that in normal years erosion almost ceases. In the great floods, which impress themselves on human memory from their very rareness, the trees will be uprooted and the ferns, etc., scoured away. It is at such times that the obstructions are most effectively eroded, though the converse action may happen, too, as the obstruction may serve to accumulate a great pile of debris of all kinds.

Continuing upstream, we come to a very wild gully with great dark caverns on the right and on the left, and we can see the stream at work undercutting the sandstone walls. We have reached a soft shaly bed in the sandstone, and the wildness of the scene is a testimony to the activity of the erosion.

We soon come to the "Cathedral," where the narrow gully with precipitous walls gives an effect which strongly suggests a Gothic nave, especially as the cliffs overhang on both sides, owing to the superior resisting power of a hard bed of rock which caps the cliffs. The track leaves the stream bed at the entrance to the Cathedral and climbs up a small tributary valley until it reaches the level of a soft stratum which has been much eroded. This shaly bed is easily traced for the next half-mile, as the track continues at this horizon although the river is 100ft. below. This section is often referred to by the misleading title —the Underground River. The narrow chasm is cut through alternate strata of hard and soft rock, the harder beds remaining bare and little altered since the time when the gorge was cut; whilst the softer beds are fretted into a series of long caves, in which many ferns grow with luxuriant freshness.

The method whereby the water was able to cut a deep gorge through this resistant rock is clearly seen, for the hard walls of the underground river are a continuous series of giant potholes, which make by their summation a long narrow gorge. It will be observed that in the places where there are three terraces of hard rock, the potholes in each terrace are independent, showing that each layer was cut through independently by a small waterfall, which having cut a cylindrical hole through one hard stratum rapidly excavated the softer bed below, so that the hard rock was undercut and eventually fell. In this way the waterfall cut back and started to make a new pothole. This action can be seen in progress at a small fall near Neate's Glen; but the consecutive cutting of the hard beds can be best realised as we walk up the underground river. At first there are three levels of fern-covered caves beneath our feet, but on passing a small waterfall (easily detected by the roar of the water) we find only two cave terraces, and so eventually after two more falls the track is again at stream level and we are walking through a fern-clad cave.

The next feature of interest may easily be passed without being recognised, but even if this happens an observer has a second opportunity after ascending Neate's Glen to the level at which ferns cease. He must then leave the track and climb back towards the Canyon. From the edge of a fine cliff a wider view presents itself, and it will be obvious that the river has changed its course at some fairly remote epoch; for a strongly marked line of cliffs, fretted by deep caves, maintains a direction in conformity with the main line of the Canyon, whereas the river sweeps round in a big curve convex towards Neate's Glen. The river is again cutting a bow-shaped canyon, but the new wall is only about 100ft. in height. At this place the valley greatly exceeds its average breadth, for the space between the old cliff line and the new shallow canyon has been denuded down to the level of a hard bed of rock forming a flat-topped bluff or "bench" in the middle of the Canyon. This scene conveys the best possible proof that the cutting of the gorge is due to water action alone, without any assistance from faults. The same scene affords an excellent set of examples showing the efficiency of the protection afforded against weathering by a hard stratum of rock with massive jointing. This highly resisting rock overhangs the softer rocks below by many feet, and serves the same function as the eaves of a house. As the overhang is considerable on both sides of the valley, the gully is much narrower at the top than at the bottom. In the same neighbourhood are some striking debris. When the river has succeeded in undercutting the cliffs nearly to the next joint plane, the whole cliff face falls, and renews its freshness and its vertical nature, but the valley is partly choked with debris. Again the massively jointed rock shows its superior durability, and several blocks of giant dimensions litter the valley, although the smaller pieces have long since been removed by the stream.

Halfway between Neate's Glen and Wall's Cave we have another striking proof that the Canyon was not developed along a fault line. As we walk upstream the direction of the river makes a sudden turn of 180°, and the canyon structure suddenly ceases at the bend, where three striking bluffs look down the stream. Once round the bend we find ourselves in a valley with one sloping bank of uniform steep grade stretching to our right, covered with swamp-loving grasses and a few swamp trees. The other bank of the valley is a low cliff, the wall of a bench, similar to the one described earlier, but only a few feet in height measured from stream level. The place is worth careful mapping, in order to discover the cause for the change in scenery that occurs there. I should be glad if some of our members could supplement these notes by some constructive work of this nature; whilst I look forward to the time when we can publish a series of photographs, or, better still, stereo-photographs, showing to many geologists in other parts of the world our treasures, whether of scenery or of geology.

The neighbourhood of Wall's Cave is perhaps the most interesting of the whole Canyon. Here a volcanic dyke four feet in thickness penetrates the sandstone rock, and is more easily weathered than the sandstone. Standing on a "bench" overlooking Wall's Cave, this dyke may be traced for some distance cutting abruptly across the Canyon, which meanders in a big loop. The creek can be traced from its sources in the large swamp below Medlow, down a long valley with grassy banks, into this short section of the Canyon. Halfway round the big loop the river disappears: the remainder of the loop being a dry valley. Descending to the river we find that the water flows through a tunnel in the solid rock, at the very place where the dyke penetrates the sandstone. Evidently the copiously jointed dyke rock has been worn away by stream action, and the tunnel so formed, widened by the erosion of the sandstone in the immediate neighbourhood of the dyke, so that the bow of the canyon bend is now a dry valley, although its level is little above the level of the tunnel. We are here face to face with a recent structure in the geological sense, but the word recent must not be interpreted too literally. The Blue Mountains and their gullies are in many ways well preserved fossils. Denudation has proceeded so far that the catchment areas of the present streams are only a small fraction of the areas drained when the Grand Canyon and its co-eval gullies were being actively carved out of the solid sandstone; and the cutting power of the streams has been greatly diminished in consequence of the reduced flow of water.

The effect of the Blue Mountain scenery on different minds varies in a peculiar way; but the writer has experienced the strongest feelings of wonder and reverence which go on increasing with increasing acquaintance. The secrets of the architecture of the canyon-like valleys which dissect the mountain plateau have unfolded themselves slowly; but each succeeding visit has afforded new delights resulting from an increasing facility in interpreting causes from observation of the effects produced. During a period so full of stress as the last five years, a contemplation of the grandeur of Nature, as exhibited in gorge and precipice, has given ground for hope that long periods of peaceful prosperity may follow this Empire-shaking war, just as the Grand Canyon River has long spells of quiescence between the periods of its turbulent activity.

AN ENEMY OF THE RED BACKED SPIDER

(*Lathrodectus liasseltic,* Thor.)

By W. W. Froggatt, F.L.S., F.E.S.

During the last month two of the reputed poisonous Red-backed Spiders (*Lathrodectus liasseltic*), finding a secure home in the corners of the Fly Aviary at the Government Sheep Fly Experimental Station at Moree, with abundance of flies right to their hands, spun their parlours in the background, and constructed the open roomy nurseries on the side, in which they constructed and suspended their round light-brown silken cocoons, four in number, each packed with soft semi-transparent eggs, up to two hundred in number. The officer in charge, Mr. Macdonald, always on the lookout for the spread of the sheep fly chalcid wasp, looking round one morning noticed a number of tiny black chalcid wasps wandering quite unconcernedly about in the spider's nursery, and on closer examination found that these little shining black wasps were emerging from one of the cocoons, being evidently parasitic upon the eggs, enclosed beneath its shelter.

Further search proved that in the station skin shed, where the same spiders had many cosy corners, large numbers of the cocoons were full of tiny wasp parasites, in all stages of development, instead of baby spiders.

Naturally he considered from casual examination that *Masonia brevicornis,* the sheep fly chalcid wasp, had another foster mother in the Red-backed Spider, but when the writer placed them under a strong lens it was at once seen that they were quite a distinct species, not even closely related to the sheep fly parasite. In examining these parasitised spider cocoons they were found to contain from 26 to 85 perfect little wasp pupae. In captivity in a roomy test tube the freshly emerged spider chalcid wasps when placed with some fresh spider cocoons immediately turned their attention to the cocoons, and at once set to work to pass their eggs through the silken covering.

This discovery is an interesting glimpse of Nature's method of control, in the spread of the Red-backed Spider. This handsome jet-black spider, with its brilliant splash of bright warning red on the middle of its rounded body, is very common all over Australia, making its home in sheltered dry corners of sheds and outhouses, under heaps of fencing posts, and a very favourite locality is an overturned empty case or box.

GERMINATION OF CHOKO SEED.

By Miss A. A. Brewster.

The fruit of the Choko is a one-seeded berry, the seed being embedded in a fleshy pericarp (fruit covering). On placing a thin section under the microscope, the cells are seen to be crowded with starch grains which turn blue when treated with a drop of iodine solution. The fruit also contains much moisture. Botanically the seed is normal in structure, consisting of the embryo enclosed in a testa or skin. As germination of the embryo proceeds there appear a plumule or first shoot, a rudimentary radicule or primary root and two large fleshy cotyledons or seed leaves. The cotyledons quickly enlarge, and partially push out of the fruit. The testa does not enlarge, but divides into two plates, which remain within the fruit adpressed to the enclosed portion of the cotyledons and act as food and moisture transporters to the growing embryo, from the stores contained in the fruit. On account of the abundant supply of water contained in the Choko fruit, the radicle, which is usually the first part of a seed to grow, and the main function of which is to furnish a supply of this essential, is rudimentary. The shoot grows first, and later the secondary roots burst from the rudimentary radicle.

BIRDS SEEN AT "GOORIANAWA," CENTRAL WESTERN DISTRICT, NEW SOUTH WALES, DURING AUGUST.

By E. Oliver Edwards.

Goorianawa is situated 39 miles east from Gular (on the Coonamble line) and 12 miles from Baradine. It is at the foot of the Warrumbungle Range, Mt. Exmouth (3000ft.) being about 10 miles to the south.

Commencing with the order Galliformes, I have observed two members of the Pheasant family Phasinianidae, but only on one occasion. These were the Brown Quail (*Synoicus australis*), and the stubble Quail (*Coturnix pectoralis*).

Up to the present I have not seen any birds belonging to the order Turniciformes.

Of the order Columbiformes, the Dove family, Peristeridae, is well represented, the introduced Indian Turtle-Dove (*Turtur ferrago*) being fairly often seen. The Diamond Dove (*Geopelia cuneata*), a smaller bird, is also common. Flocks of Crested pigeons (*Ocyphaps lophotes*), quite charming birds, are commonly seen feeding in the grass. One is often surprised by these birds rising with a whirr quite close by.

Passing on to the order Charadruformes, there is one representative in the family Oedicnemidae or stone curlews which I had the luck to see; this was the southern stone curlew (*Burhinus grallarius*). They seem to be very shy birds, and will not allow anyone to approach within any distance of them.

The Straw-necked Ibis (*Carphibis spinicollis*), belonging to the order Ardeiformes, family Ibididae, put in an appearance with the wet weather, flocks of them groping about in the boggy ground in search of insects. Here the advent of these birds is considered a sign of rain, but I cannot see why this should be so, possibly because of the Egyptian story that on the arrival of Ibises the Nile generally became flooded.

Of the birds of prey, Accipitriformes, the Wedge-tailed Eagle (*Uroaitus audax*), of the family Falconidae, is plentiful, and is destructive to lambs. These are the largest eagles known, their length being 38 inches from the tip of bill to the tip of tail.

We now come to the order Psittaciformes, or parrots. Of these the White Cockatoo (*Cacatua galerita*) is very common, as well as destructive to trees. I have seen large gum trees almost stripped of their leaves, and the strange thing is that these birds appear to choose one tree, and not trouble about the rest in the neighbourhood. The Rose Breasted Cockatoo (*Cacatua roseicapilla*) is also very common, and is generally to be seen in flocks on the ground foraging for grass seeds, which constitute its chief food. These birds are just beginning to pair off for nesting. Of the family Psittacidae, or parrots, the Rosella (*Platycercus eximius*) is to be seen occasionally, while the Red-backed Parrot (*Psephotus haematonotus*) is easily the commonest of them. They are to be seen feeding on the grass, or among the gum trees, generally in flocks, but sometimes in pairs. I observed the Grass Parrot (*Neophema elegans*) on one occasion.

The order Coraciiformes is represented in the family Alcedinidae by the Laughing Kingfisher (*Dacelo gigas*), whose merry laugh is to be heard regularly in the mornings and evenings.

Another bird of infrequent occurrence is the Pallid Cuckoo (*Cuculus inornatus*), order Coccyges, which I have only seen once.

We now come to the large order Passeriformes, or Perching birds. In this order the family Hirundinidae, Swallows and Martins, is well represented. The welcome Swallow (*Chelidon neoxena*) is quite common. A pair at present have half constructed their mud nest on our hut. They are quite tame; in fact one can almost touch them before they will take to flight. The Tree Martin (*Petrochelidon nigricans*) is very common, and is easily distinguished from the ordinary swallow while in flight by the whitish rump, but when at rest they are very similar. Now to come to the Muscicapidae, or Flycatchers. The well-known Jacky Winter, Australian Brown Flycatcher (*Microeca fascinans*) is to be seen occasionally, but no Robins have come under my notice. The Restless Flycatcher (*Seisura inquieta*) is a great friend of the stock and cattle, and is often seen upon, or hovering over their backs removing troublesome insects.

About the most common bird here is the Grey-crowned Babbler (*Pomatorhinus frivolus*). The bird is very interesting to watch. It builds its nest of medium-sized twigs with an entrance in the side on the end of a thin branch, but quite exposed to view; no attempt appears to be made to hide it in any way. These birds do not build every year, but return to their old nests, and patch them up. They are very pugnacious, and will attack anything that approaches their nest. I even saw one attack and drive away a hawk which, unfortunately, I was unable to identify. This probably accounts for the conspicuousness of their nests, as the birds are evidently fearless.

The only representative of the family Turdidae is the White Fronted Chat (*Epthianura albifrous*), and only on one occasion did I see a small flock of these birds. Of the family Sylviidae or Warblers the little Tit-Warbler is the only member that I have observed. The Wood Swallow (*Artamus tenebrosus*) of the family Artamidae, is often to be seen among the branches of dead trees, where they build their nests.

Belonging to the family Prionopidae, the well-known Magpie Lark, or Peewee (*Grallina picata*) is very common. At present these birds have begun to pair for the nesting season, and in some cases building has just commenced. The Black-backed Magpie (*Gymnorhina tibicen*) is a very interesting member of the Laniidae, or Shrike, family, especially during breeding season, which has just begun. These birds have a habit of attacking anyone approaching their nests; their method of attack is to fly overhead, and suddenly drop within a few feet of your head, then rise again and repeat this procedure until you move to a safe distance. This is rather a foolish thing for the birds to do, as, when one knows there is a nest in the neighbourhood, it is no hard task to find it. I have noticed also the White-backed Magpie (*Gymnohina leuconota*), but have not yet seen these birds attack anyone.

The White-throated Tree-Creeper (*Climacteris scandens*), belonging to the family Certhiidae, or Creepers, is to be seen in the more thickly wooded parts of this district, but is far from common. The family Meliphagidae, or Honey-eaters, is represented by the Noisy Miner (*Myzantha garrula*), which is very common, and, like the Grey-crowned Babbler, is very pugnacious, and attacks anything that comes in its way. The chief food of this bird in this district is insects, since there is very little honey to be obtained, except on the thickly-wooded hills. Another member of this family, which is to be seen occasionally, is the Wattle Bird (*Acanthochaera carunculata*), but it is very rare.

Of the Motacillidae, the Australian Pipit (*Anthus Australis*) is often to be seen running along in the paddocks, where it so cleverly conceals its neat little nest.

The common House-sparrow (*Passer domesticus*) is to be seen occasionally, while the flocks of spotted-sided Finchs (*Stagonopleura guttata*) of the Ploceidae family are fairly common. A few starlings (*Sturnus vulgaris*) are to be seen, but they are far from common. Finally, there are several members of the Corvidae family. The Australian Raven (*Corone australis*) is very troublesome to lambs, and when hungry will even kill the latter. The Apostle Bird (*Struthidea cinerea*) is very common. These noisy birds are at present in flocks, and have just started to pair. The White-winged Chough (*Corcorax melanorhamphus*) is also a common bird, and like the Apostle bird in habits. The last two birds build mud nests, and their chief food seems to be insects and seeds obtained on the ground.

A TRIP TO GOSFORD.

Abstract of Report by Miss Isabel Busby.

In the course of a short holiday during the Michaelmas vacation of 1918, Misses A. A. Brewster, Austin, and Busby explored botanically the localities in the Gosford district mentioned below, and were rewarded with many interesting finds, besides having a very pleasant and scientifically profitable excursion—*Boronia pinnata* and *Gomphlobium grandiflorum were* at their best, and *Pultenaea flexilis* formed beautiful patches of golden cloud, while everywhere along the railway embankments the frail loveliness of the blue iris, *Patersonia servicea,* was in evidence. A walk from Gosford to Point Frederick took the party past the salt marshes bordering the Broadwater. Here the dominant vegetation was the fleshy red-tipped *Salicornia* and *Spergularia,* while patches of *Juncus maritimus* and *Cotula coronopifolia* were noticed, also, bordering the swamps, *Melaleuca pauciflora* and *M. armillaris.* All along the water's edge were mangroves (*Aegiceras*), with its breathing roots or pneumatophores. In the swamp were *Melaleuca pauciflora* and patcthes of mosses, notably *Sphagnum,* with here and there beds of the native violet and other shade-loving plants. Another walk, this time to Mount Penang through most beautiful scenery, yielded a greater abundance of flowers than on the lower ground. The white blossoms of *Leptospermum* formed exquisite masses everywhere. At several places patches of the large moss *Dawsonia polytrichoides* were discovered in spore, the sporophyte showing the pretty reddish brown calyptia. In the marshes on the highlands the prevailing vegetation consisted of reeds (*Juncus*), with abundance of *Sowerbaea juncea* and the giant sundew (*Drosera binata*), *Eriostemon hispidula,* and *Conospermum longifolium,* were also noticed. A single bush of *Prostanthera linearis* was observed on the lower slopes of Mount Penang. The remaining trips were made by horse and trap, enabling the party to cover longer distances without undue fatigue. A four or five miles drive brought us to Mr. H. Pile's homestead, where the trap was left, and Mr. Pile, who is himself a lover of flowers and well versed in bushcraft, acted as guide to Moonee Creek. On the way down was an outcrop of sandstone where soakage kept the edges damp, and here were found patches of *Darwinia taxifolia* in quite a recumbent form, sending long spreading branches over the shallow soil on the rocks. The foliage was greyish green and the flower heads of two, three, and four florets were mostly green. In the adjoining bush was the erect *D. fascicularis* and clumps of *Juncus* in moist spots. Access to the creek is by way of a rocky precipitous pathway. Here the mangroves were again noticed, while along the banks were masses of the lovely mauve-coloured *Prostanthera incisa.* In the Moonee gully both the lyre bird and the Australian roller or dollar bird occur. The next drive was to Terrigal. The scenery for the whole of the eight miles from Gosford to Terrigal is lovely, the road passing through luxuriant bush with numerous orchards and farms. About a mile from Terrigal we heard the "tink-tink" of the bellbirds, faintly at first, but soon we came to a spot where the birds could be seen flying across the road. We drew up here for a while and watched them as they hung on to the drooping branches of the wattle trees in search of insects, and we saw some baby bellbirds getting their midday lunch from their parents' beaks. This bird, however, is not the true bellbird of Australia, but the bell-miner, a species of honey-eater. The bush here was sub-tropical and seemed to be a veritable bird's paradise, probably on account of the abundant insect life. As we boiled our "billy" for lunch, we were visited by those friendly and delightful birds, the yellow robins, while from the bush came the notes of the thrushes, coach-whip birds and whistlers; a dainty Lambert wren seemed to have its nest near, and we also saw the mistletoe bird and the sanguineous honeyeater.

Arriving at Terrigal, we found a delightful little village, with a fine stretch of sandy beach. The sand binders and builders were *Festuca* and *Spinifex,* and the retainers *Banksia, Eugenia,* and *Wickstroemia.* The flora here, and also on the sandy hillsides of Mount Penang, is xerophytic. A little way back from the beach the ground rises to hills clothed with abundant vegetation. Here the *Macrozamia* "palms" abounded, and seedlings were found in all stages, from the "nut" with its two cotyledons in contact with food supply in seed, and large taproot, to mature seedlings.

On the way home we took the old road, having driven out by the new. This route is along higher ground, so that although we missed the heavily timbered belt, with the sub-tropical vegetation, we had the advantage of the wider views. And beautiful indeed was the prospect as we drove into Gosford; the sun was just sinking behind Mount Penang, the sunset hues reflected in the Broadwater making a golden pathway. We felt it to be "the close of a perfect day."

REPORT OF THE EXCURSION TO NARRABEEN, 11th OCTOBER.

About 30 members took part in this excursion, which was primarily arranged to demonstrate how to find the larvae of Satyrid and Hesperid Butterflies. The first species obtained was *Tisiphone abeona,* feeding on *Gahnia* (sword grass) growing in the bed of the creek. The larva is wholly green with a forked tail, and feeds during the night, hiding amongst the leaves of the foodplant during daytime. The perfect insect was also on the wing. Larvae of *Hesperilla picta* were also found on the swordgrass. These hide during the day in a shelter made by drawing the leaves in the centre of a tuft together; the larvae is pale greenish with a very hard head which bears brown lines. On grass growing beside the creek several larvae of the *Xenica acantha* were found; these are usually grass green with forked tail, though at times brown ones are found, as on this occasion. The head is provided with two projecting horns at the top, and is rich brown with two darker brown ovoid patches in front. Several brown larvae of the large skipper *Trapezites symmomus* were found in shelters amongst their food plant (*Xerotes longifolia*). Several interesting moths were captured by one of the members and a number of botanical specimens obtained,

G. A. WATERHOUSE.

OBITUARY.

Mr. W. J. Rainbow.

It is with the deepest regret that we record the death of our esteemed friend and colleague, Mr. W. J. Rainbow. No member of the Society was better known to members than Mr. Rainbow, and his genial presence will be missed alike at Council and Ordinary Meetings.

For many years past Mr. Rainbow has been a prominent figure in scientific circles in Sydney, and more especially to those visiting the Australian Museum, where his ready help was ever gladly accorded to all. It was perhaps in connection with his specialty, the Araneidae, that our friend was most closely associated, he having for a long period devoted himself to the study of this group, on which he was the recognised Australian authority. Mr. Rainbow published numerous papers, and two works of a popular nature:—"A Guide to the Study of Butterflies" and "Mosquitos: Their Habits and Distribution."

Mr. Rainbow was first editor of the *Australian Naturalist,* which he conducted with marked success until pressure of work compelled his giving it up.

It is only quite recently that he completed an important piece of work, the description of the Araneidae collected at Macquarie Island by the Mawson Expedition. Another recent paper in conjunction with Dr. Pulleine, recently noticed in these columns, was a study of Australian Trap-door spiders.

Mr. Rainbow's second son, Oscar, was killed at Gallipoli in the performance of a very gallant action, and his younger son, Eric, only returned from active service abroad a few days after his father's death. Mr. Rainbow was predeceased by his wife in 1917, she never having recovered from the shock of her gallant son's death. T. S.

EXCURSION.

The excursion to Homebush Bay (8th November) following upon the lecture by Mr. A. A. Hamilton on the Ecology of the Salt-marshes, was well attended, and a number of the plants depicted, whose environmental characteristics had been explained by the lecturer, were seen in situ. A. A. H.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

3rd February, 1920.—The President, Miss Le Plastrier, in the chair, and 45 members present.

An announcement was made re the use of two microscopes kindly lent by the Department of Health for the benefit of members desiring to exhibit microscopic objects.

Miss Hilda Butler and Miss Elsie Gough were elected members.

Mr. H. E. Finckh exhibited a specimen of *Riccia fluitans,* with observations on the distinctive habits of the terrestrial and aquatic forms; Miss Le Plastrier some interesting examples of the Riverina flora, with notes suggestive of protective mimicry in certain Mistletoes; Mr. L. Gallard read a note on the life history and habits of the Dicky Rice Weevil *Prosaleus phytolymus,* and exhibited specimens illustrative of the characters described.

In an interesting address entitled "War in the Mangroves," Mr. A. R. McCulloch gave a terse account of the struggle for existence in which the inhabitants of the Mangrove swamps are constantly engaged. The lecture was illustrated by a fine series of lantern slides—some of which must have been secured under exceptionally difficult circumstances—illustrating various phases in the life history of the creatures passed under review.

March 2nd, 1920.—The President, Miss Le Plastrier, in the chair, and 35 members present.

Miss R. Dowling and Mr. David Ferguson were elected members of the Society.

Miss H. Drummond exhibited a set of geological specimens from Mona Vale, with a note on *Phyllotheca.* Miss Winter contributed a note on an interesting experiment by which the leaves of a giant sedge *Cladium jamaicense* were preserved for a lengthy period in a suitable condition for feeding larvæ, and exhibited some excellent photos of the typical aquatic flora of Duck River taken on the monthly excursion.

An example of fasciation in *Scaevola hispida* was exhibited on behalf of Mr. M. S. Barnett, by the Hon. Secretary. This abnormality has not, as far as can be ascertained, been previously noted in the genus. Mounted leaves of the Chestnut, Wistaria, Honeysuckle, and Hazel-nut, were exhibited to illustrate notes on leaf-cutting bees by Miss Mabel N. Brewster.

Miss A. A. Brewster gave an interesting account of the pollination of the Geebung *Persoonia lanceolata.* Observations covering a number of years were explained in detail, and the subject was illustrated by a fine series of coloured drawings depicting the most important features referred to in this comprehensive study. A micro-slide of the leg of the andrenid bee which pollinates the "Geebung," and a wingless bush cockroach with an egg-mass attached to its abdomen, were also exhibited.

Mr. E. Cheel delivered a lecture on "Plants which Produce Manna." The historical aspect of the subject was exhaustively treated, especially in Scriptural times, and the careful research methods characteristic of the lecturer were strongly in evidence. Mr. Cheel closed with the novel suggestion, supported by his personal observations, that the manna which he obtained from *Eucalyptus Smithii* and *Euc. citriodora* is the product of the larvæ of a Cup-moth which feeds on the leaves. The insect disgorges a portion of the partly assimilated food as a watery fluid which coagulates into the white granular mass known as manna.

In proposing a vote of thanks to the lecturer, Mr. A. G. Hamilton offered some pertinent remarks on various insects more or less directly concerned with the production of manna. Miss A. A. Brewster—who seconded the proposal—drew attention to the intimate relationship of the insects mentioned most of which have adopted a biting or sucking habit when feeding. The vote of thanks to the lecturer was carried by acclamation.

ERRATUM.

Presidential Address, Aust. Nat., Jany., 1920, p. 115, 2nd line from bottom should be 16th from bottom.

THE CULTIVATION OF NATIVE PLANTS.

DISCUSSION AT MEETING, DECEMBER, 1919.

Mr. E. Cheel, in opening the discussion stated that although there were very many showy floriferous native plants well worthy of a prominent position in our private gardens, as well as in our public parks and gardens, there was not the demand for these as in the case of roses, carnations, dahlias, and many other imported plants, hence the nurserymen and seedsmen did not specialise in the native plants as in the exotics. In Great Britain, France, and the United States of America, there was a much keener demand for Australian plants. In California, for example, there was quite a brisk trade in Australian Wattles (*Acacia*). As far back as 1860, they were grown in pots and exhibited at agricultural fairs. It is on record that seeds of *Acacia* were imported from Australia in 1854. In 1862 the seeds and plants of as many as 12 species of Australian acacias were catalogued for sale by nurserymen in San Francisco. They are still very popular in the United States, and in certain parts of Europe, and very high prices are paid for certain species, the most favored being *Acacia pubescens.* This latter species is a native of Bankstown and Lidcombe district, and is very beautiful, both as regards foliage as well as when in flower. In South Africa certain Australian Acacias are cultivated fairly extensively for tan-bark and for shelter belts, sand binding, and for fuel. It is on record that in 1891 about 1600 lb. of Acacia seed were sown or distributed to the public. It is estimated that between 1888 and 1889 not less than 20,000 lb. of seed of various species was distributed to planters in South Africa.

Many people are under the impression that our Australian plants are difficult to cultivate. This is not so, for we find quite a number are easily raised from seed, and others are easily propagated from cuttings. Our native fuchsia (*Correa speciosa* and *C. alba*) were cultivated many years ago in England, and coloured drawings made and published in the *Botanical Magazine,* where it is stated that "cuttings strike root quite easily." Mr. Cheel has raised plants by striking cuttings of *Callistemon viminalis,* a fairly popular Bottle-brush tree, in private gardens in the North Shore suburbs, and also in the Western Suburbs. He has also raised some fine hybrid Bottle-brush plants that are a credit to the Botanic Gardens. Mr.

Cheel mentioned quite a number of native plants, such as Christmas Bells, Tea-trees, Native Heaths and Orchids, that ought to be taken up more extensively for cultivation. The Swan River daisies, Everlasting flowers, such as *Helichrysium*, *Helipterum*, and *Acroclinium*, were sold by nurserymen, and cultivated in the older lands, and occasionally in Australian gardens; but it was not generally known that these latter were natives. The *Boronias* and *Swainsonias* were very showy, and ought to be more extensively cultivated. Quite a number of our Eucalypts were well worthy of more extensive cultivation as shade trees in our parks, and for street planting, and also a select few could be chosen for avenues. Mr. Cheel suggested that the Shire Councillors and Aldermen of the Municipalities would be well advised if they were to give some of the Eucalypts known to be endemic to their respective shires or municipal districts a fair trial, instead of planting exotic trees, which are frequently unsuitable.

Mr. A. C. Duckworth contributed the following note:—

I would like to report an instance where the transplanting of Native Flora has been successful. At Long Bay, in a wild garden, we have a number of Native Shrubs, and in addition to these we have transplanted from the bush successfully the following:—

1. Flannel Flower (seed and seedlings).
2. Christmas Bell (root).
3. Broad-leafed Geebung (seedlings).
4. Everlasting Flowers (seeds).
5. Burrawang Palm (root).
6. Native Fuchsia (root).
7. Native Rose (root).
8. Orchids (white with yellow centre, root).
9. Fringed Violet (root).
10. Rock Lilies (root).
11. Wild Violets (root).
12. Clematis (root).
13. Bush Flag (root).
14. Wild Parsley (*Lomatia silaifolia*) (root).
15. Vanilla Plant (*Sowerbaea juncea*).
16. Drum Stick (*Isopogon anemonifolius*).

The plan has been to as far as possible plant in similar surroundings and position to that from which the plant is taken, the smaller the plant the better. It is surprising how small an amount of attention these plants need; when planting, the soil is loosened and watered. A most successful instance has been that of the Native Fuchsia, which I think is rather a hard subject. It is remarkable how long a small cutting of Christmas Bush will keep green when planted, and yet it is eventually found not to have rooted, it is rather a difficult plant to deal with.

A very successful case of transplantation is that of the Flannel Flower, which we grew in a pot for the purpose of exhibiting at a small exhibition of Native Flora. Seedlings of the above are fairly easy to transplant, and yet seeds are more successful if sown broadcast. The broad-leafed Geebung is another, which is easy to grow from seedlings, and I may suggest that either this or the Pigeon Berry shrubs would make a unique hedge. Everlasting Flowers multiply rapidly, and grow from seed abundantly. I may add that in some cases plants have died after a time, in a stretch of dry weather owing to difficulty of watering. I hope we shall continue experimenting.

FOSSIL TRILOBITES FROM PORTLAND.

By Miss Heather R. Drummond.

Some years ago a great many trilobites, belonging chiefly to the species *Hausmannia meridianis,* were found in a band of clay shale in the Portland cement quarry. The limestone here is some hundreds of feet in thickness, and traversed all through by beds of shale and clay containing a great deal of lime. The shale, containing the fossils was quarried and crushed for the manufacture of cement!

Some of the imprints, however, were gathered, and a specimen sent to Sydney. The authorities here sent for some specimens, but by the time their collector arrived there most of the shale in that bed had been crushed.

The public school teacher at Portland is now in possession of a few specimens, one exceedingly perfect, which is about an inch and a-half through.

The specimen shown has a fairly perfect head, and the eyes are prominent. It has, however, been pushed out of shape a little by the rock pressure.

The three other fossils, were of the upper marine series; two, collected by me at Wollongong (*Cleobis grandis* and *Maeonia audax*), and a good specimen of *Martiniopsis* subradiata from Gerringong. This latter was collected two years ago, and shows the internal structure of the tractiopod remarkably well.

ROOT FASCIATION IN CYCADS.

By A. A. Hamilton.

In a note in this journal (V. 4, p. 28), attention was drawn to the occurrence of apogeotropic roots in *Cycadaceae,* with special reference to the coral-like formation of the aerial roots of *Encephalartos villosus.* In a recent work dealing with malformations, abnormalities, &c., Worsdell (Principles of Plant Teratology, V. 1, p. 68) says: "The apogeotropic coralloid respiratory roots of *Cycads* must probably be regarded as instances of normally fasciated roots." The phenomenon of fasciation—flattening or banding—in the stems of plants, is a common occurrence, but the expansion is usually the result of abnormal conditions. In the "Cocks-comb" (*Celosia*) this habit has been fixed by the horticulturist and the plants produce the flattened stem under normal conditions, though the expansion may be considerably increased by an excessively rich manurial diet. In a paper on Bacterial nodules, &c. (this journal, 2, 192), W. M. Carne drew attention to symbiosis in *Cycadaceae,* and referred to the work of Professor Bottomley. In a recent article dealing with this subject (Ann. of Bot., V. 29, p. 619), Ethel R. Spratt, supplements the Professor's conclusions, and shows that all the Cycadean genera produce root nodules, which are perennial modified lateral roots, repeatedly branched, and typically forming large coralloid masses, and these structures are primarily produced by infection with *Bacillus radicicola.* The writer adds: "The Cycadaceae . . . . are the only nodule-bearing plants known in which four organisms are associated symbiotically, viz., two nitrogen fixing bacteria, an alga, and the cycad." The activities of bacteria when present in plant tissues are generally recognised as a potent stimulating factor in the production of fasciation.

LEAF OF THE GRASSTREE (XANTHORRHŒA).

By Miss A. Brewster.

This leaf is really more like a stem of a monocotyledonous type. In the presence of palisade tissue (the food factories), it retains its character as a leaf.

In cross section there can be seen a mass of ground tissue, a pith-like mass, in which are embedded numerous veins or vascular bundles, similar to those of the maize stem.

The most striking features of the leaf are: (1) The great development of the hard, strengthening tissue or Sclerenchyma, and (2) the seemingly constant presence of numerous crystals in the cells of the epidermis.

The palisade tissue is of several layers of cells, and is interrupted by bands of sclerenchyma. It is above these bands that the crystals occur in the epidermis. There is one crystal in each little oblong cell, and in some cases the cell bulges out at the side to look somewhat like a barrel. There are lines of these crystal cells interrupted now and again by cells with no crystals present. The crystals and stomates can be seen by tearing off a piece of the epidermis, and mounting it in water.

Over the palisade bands are the stomates, and the subsidiary cells encircling each stomate, give the epidermis a very beautiful appearance when seen under the microscope.

The longitudinal section shows some very interesting thickenings of the cells in the sclerenchyma areas of the palisade zone. In the outermost layers the cells had completely lost their identity as such in many cases. There remained only intensely thickened long stick-like pieces of walls with patches of the thicker parts dotted over with little projections of thickening, giving them the appearance of "burrs."

Working inwards one can see the cell walls getting gradually less thick; till only a few very tiny projecting points of thickening were visible.

The leaf is a very strong xerophytic or heat-resisting type. This is shown by (*a*) the reduction of surface in the long narrow form, (*b*) the presence of palisade cells all around the leaf, and (*c*) the presence of the thickening bands.

AERATING ROOTS OR PNEUMATOPHORES OF MANGROVES (*AVICENNIA*).

BY MISS AGNES A. BREWSTER.

These are curiously modified roots, whose duty is to stand erect and take in an air supply to the ordinary roots of the Mangrove. They are joined to the normal roots by a stalk-like constriction. The lower part of an aerating root, which is sunken in the mud, is darker in colour than the upper, more exposed, portion, which projects above the water at low tide. On breaking it across in the lower part, it is seen to consist of:

(*A*) A central woody zone enclosing a small pith, and

(*B*) An outer spongy soft area which carries an aerating system of intercellular spaces, called aerenchyma.

These air spaces are continued into the upper part of the aerating root, and lead into little round lenticel-like patches dotted over the outer surface of the erect root. When examined with a lens these "doorways" or openings for the ingress of air are seen to consist of an outer circular rim of bark having the centre filled with loose corky cells with spaces between to allow of the passage of air.

Another interesting feature is the presence of fibrous horizontal mooring roots on the lower parts of the pneumatophores, confined chiefly to the landward side, and having small fibres which penetrate the mud, thus anchoring the aerating roots and giving them more power to resist the pull of the outgoing tide.

OBSERVATIONS ON THE LEAF-CUTTING BEE, MEGACHILE CHRYSOPYGA.

BY MISS MABEL N. BREWSTER.

We made some very interesting observations at Clarence Siding, Blue Mountains, in January, 1919. At the end of a long stone verandah were a number of rose bushes, two clumps of honeysuckle, and nearby were apple, plum, hazel-nut, and quince trees. There were numbers of the dark leaf-cutting bees busily working all day among the leaves of all these trees till 7 o'clock at night.

Some of the smaller branches of the rose bushes had their leaves reduced to shreds by the too-frequent visits of these workers. We watched them approach the bushes, and they were rather hard to please in their choice of leaves, for they alighted here and there before making the final selection. Occasionally they would make a slit and then leave the leaf. There were numerous leaves which showed that the leaf-cutter had begun its operation, and for some reason or other had left its work.

Most of the bees worked from the edge of the leaf and round to the right, but occasionally we saw one cut from right to left.

The more common shape cut out of the leaf was that of the elongate side-pieces for the cell of its nest. The cutting was beautifully neat, and the head of the insect moved round rapidly and smoothly. In watching the bee cut one of these larger pieces, one would think it was going to cut a smaller circle, but on reaching the half-circle it worked along, enlarging the piece, when it curved round again, cutting the piece off. The piece is then slightly bent from the outer edges and carried away with ease under the body, held by the legs. Some of the bees almost stood on their heads in the cutting process, but the majority were just slightly inclined. If one placed one's head close to the bee while it was cutting, the noise of the mandibles could be heard quite distinctly, like the "click, click" of a pair of scissors.

An amusing incident occurred. One of the bees, in severing a rather larger piece than the average, cut into a leaf vein, for on setting out with its booty it was jerked back by a thread of tissue from the vein, and had to pull several times before it finally broke the thread and flew off in triumph or in anger.

Most of the leaves cut into showed that the bees selected any leaf for either side or top pieces for the cells, but occasionally we saw leaves with a series of small circular holes only. Pieces of fading yellow leaves of roses were also used. The rose leaves, and leaves of the hazel-nut plants were evidently the favourites, though the leaves of the honeysuckle, plum and apple were also used.

The hum of these bees is quite distinct from the steady hum of hive bees. It is more jerky, and resembles the angry sound of the hive bee when it has been disturbed. As the hive bees were gathering nectar and pollen from the honeysuckle flowers nearby, we could distinctly recognise the difference between the two.

We have also seen the tough leaves of the Waratah (*Telopea speciosissima*) cut out by these bees.

Mr. Froggatt, to whom I am indebted for the identification, informs me that this bee is one of the most widely distributed species occurring in Victoria and New South Wales.

On going up to Clarence Siding this year (1920), in January, we found the bees again at work cutting the leaves of several plants: this time they favoured the young leaves of Chestnut, Wistaria, and Honeysuckle. Summing up the plants whose leaves were attacked, I found that no preference was given to any particular plant, but that the bees cut more often from those whose leaves were young and plentiful, though they had visited all those mentioned above.

A bee was captured and examined with a lens. Its tongue was long and slender, and similar to that of the hive bee. Its body was black with patches of dense white hairs. On the abdomen there were fringes of hairs at each of the prominent segments giving the bee a banded appearance. The legs were densely clothed with hairs, which were coarse and stiff, like combs, on the tibia and tarsus, but more slender on the femur or thigh. It was interesting to compare the specialization of the legs with that of the hive bee. The first pair of legs bore the tibial comb with its flap, similar to that of the hive bee. All parts of the legs were densely clothed with hairs, but with no specialised gathering hairs. The second pair of legs bore the spine on the tibia to lever out the pollen from the pollen basket. The third pair of legs were interesting in that they had long gathering hairs much more slender than those on the lower part of the legs. They were but minutely branched, compared with the gathering hairs of the hive bee and the branches could only be seen on examination with the microscope. The tibia was specialised as a pollen basket much more hairy than that of the hive bee. There were present on the tibia two strong spines which are prominent, and probably aid in the carrying of the pieces of leaves.

All the hairs could be of use in the gathering of pollen, but bees usually have very specialised branched gathering hairs on the thighs: these are most highly developed in the cultivated hive bees.

The little black bee *Trigona* has the legs almost identical with those of the hive bee, but here again the legs are not clothed with the highly specialised gathering hairs. However, some of the hairs on the thigh have stiff branches at the apex of the main hair, longer than those of the leaf cutter, and much shorter and stiffer than those of the hive bee.

NOTES ON LORANTHS FROM WAGGA DISTRICT.

By Miss C. M. Le Plastrier.

On the Albury-road, a few miles out of Wagga Wagga, I found some very fine Yellow Box (*Eucalyptus melliodora*), affording a grateful shade from the glare on the dusty road. The eastern side of each of these trees was draped with a mistletoe (*Loranthus pendulus*), which hung in festoons to within six feet of the ground. As the leaves of the eucalypt are lanceolate and those of the parasite of almost the same shape, there was only the difference in colour to distinguish them. I noted in *Loranthus linophyllus* growing on *Casuarina lepidophloia* the same adaptation to the habit of the host, for in this instance the leaves of the parasite were terete, long and slender, making it impossible except by close observation to distinguish between the foliage of the host and that of the parasite. May this be a case of protective adaptation? I find among my notes an observation on the very large leaves of the loranth (*Loranthus longifolius*) which I found growing on *Eucalyptus eximia* in Galston Gorge in 1913, contrasting them with those of *L. celastroides, L. pendulus* and others found on narrower leaved varieties. In *Loranthus quandong,* which was collected in Barmedman, the leaves are narrow-lanceolate, and the leaves of the Quandong (*Santalum acuminatum*) on which it was growing were also narrow lanceolate.

NOTES ON *CASUARINA LEPIDOPHLOIA.*

By Miss C. M. Le Plastrier.

The specimen exhibited was collected by me in the vicinity of Wagga Wagga, in two distinct localities. I was also shown fine specimens collected at Barmedman by the Rev. Dr. Dwyer; this was in flower with the male spikes, which were about two inches long. Moore and Betche, it may be noted, state that the male spikes are not known. The tree attains the height of about thirty or forty feet in those I noted. They are very graceful, and when found growing near the Currajong (*Sterculia diversifolia*), as I found them near the Albury-road, the dark green of the Casuarina contrasts finely with the bright green of the other tree. As it was January, there were not any flowers, but cones were abundant, and I secured several. They are fairly large, about one inch in diameter, bright golden brown, and almost globular. The branchlets are slender, the rudimentary leaves in whorls of nine. The native name, so I was given to understand, is "Currewang." On the shores of Lake Albert I was fortunate enough to find another specimen of this tree, the lower branches of which were covered with *Loranthus linophyllus,* the bright red flowers contrasting with the dark foliage of the host. As the leaves of this mistletoe are not unlike the branches of the *Casuarina,* the general effect was of a flowering tree.

EXCURSION TO DUCK RIVER.

Fifteen members of the Society essayed the journey. Several plants representative of the flora of the Western Plains were noted on the route from Auburn to the river, which have probably been disseminated by the stock in the resting paddocks awaiting the sales at Flemington. Two of these were *Composites,* both known in the West as Bindy-eyes (*Calotis cuneifolia* (blue) and *C. lappulacea* (yellow). The seeds (achenes) of these plants are armed with barbed bristles, which are caught in the coats of animals, and thus dispersed. A western Salt-bush, *Rhagodia nutans,* which bears bright red succulent berries, and a healthy vine of the indigenous Paddymelon, *Cucumis trigonus,* with gooseberry-like fruits, were also seen. A few bushes of a feathery-leaved (pinnate) Wattle, *Acacia pubescens,* which favours the Wianamatta shale in this district have found a sanctuary within the railway fence. This species is rapidly disappearing owing to its inability to set fruits. On the banks of Duck River the shrubby *Angophora Bakeri* is plentiful, and a tussocky plant of the rough-leaved *Gahnia aspera* displayed a quantity of bright red-bead-like fruits hanging from the glumes by the staminal filaments. In the river the dominant species is the Bull-rush, *Typha angustifolia,* the tall *Heleocharis sphacelata,* intermingled with *Triglochin procera,* also forming presentable reed beds. The leafy fronds of the Nardoo, *Marsilea Drummondii,* which are divided into four segments in the form of a Maltese cross, float horizontally on the surface, and fill the interstices in the open ranks of the Bull-rushes. A tall and somewhat rare Sedge, *Cladium jamaicense* (*Gahnia mariscus*) was observed in fruit on the river margin. This sedge is easily distinguished from its confrere the giant Sword-rush *Gahnia psittacorum,* by the stem leaves, which in *C. jamaicense* are produced in tufts. The floating Panic-grass, *Panicum obseptum,* sends out long trails from the bank into the shallow water and the Water-Pepper forms lax colonies on the boundary of the Bull-rush formation. The sour, ill-drained and imperfectly aerated soil of the shale flats through which the river winds is clothed with a shrubby vegetation represented chiefly by the family Myrtaceae, sprinkled with bushes of the Black-thorn, *Bursaria spinosa.* The undergrowth consists largely of grasses, sedges and lowly herbs interspersed with mosses and other cryptogams. Of the shrubs, Tea-trees *Melaleuca spp.,* and Bottle-brushes, *Callistemon spp.,* predominate, the greenish flowered *C. pinifolius* being well represented. The dominant grass at this season (February) is *Eragrostis leptostachya,* one of the Love-grasses; and among the herbs noted were the rare, diminutive *Logania pusilla, Comesperma sphaerocarpum, Caesia parviflora, Ruellia australis, Lagenophora Billardieri, L. emphysopus, Vittadinia australis, Hypoxis hygrometrica, Boronia polygalifolia, Convolvulus erubescens*—prostrate and closely appressed to the ground—*Goodenia paniculata* —in moist places—*Richardsonia humistrata,* an immigrant from South America, with a star-shaped leaf arrangement, which forms clustered mats. A floriferous carpet of *Isotoma fluviatilis* was noted in its usual habitat on the verge of a pool, and the aquatic *Ottelia ovalifolia* was occasionally in deeper water.

A. A. HAMILTON.

EXCURSION TO BROOKVALE.

On Saturday, March 6, a party of about 20 members and their friends went to Brookvale for the ordinary monthly excursion, under the leadership of Mr. E. Cheel.

The leader took them towards the ocean beach in the neighbourhood of the local rifle butts, where several interesting plants were collected.

Not far from the village, a halt was made to examine the plants in a grass plot through which a watercourse was running, and specimens of *Azolla, Juncus prismatocarpus, Juncus lamprocarpus, Panicum crus-galli* (Barnyard grass), and *Polygonum hydropiper* (Water-pepper), and several other species were examined and explained by the leader. Several plants of the pretty pink "Australian Ladies' Traces" orchid (*Spiranthes Australis*) and other naturalised plants were found in damp grass plots.

In the sandstone scrub along the watercourses or near peaty bogs several beautiful pink-flowering shrubs of *Leptospermum scoparium* were seen, which, Mr. Cheel explained, were identical with *Leptospermum floribunda* of older works, and which would very likely have to be taken up again, as it was quite a different plant from the original *Acoparium* of Forster. Some plants of *Acacia linifolia* and *Acacia discolor* were seen in flower, and also *Grevillea buxifolia* and *Lambertia formosa.* A nice patch of plants that interested the members very much was the "Native Plum" (*Podocarpus spinulosus*). This species appeared to be quite new to several of the members, and its edible fruits were appreciated very much. The large gibbose fruits of *Hakea pubescens,* and the softly pubescent young foliage were then examined, and compared with the common coastal "Needle Bush" (*Hakea acicularis*). Some fine specimens of *Styphelia longifolia* were collected by one of the members who had mistaken it for the common *S. viridis,* which has much shorter and more blunt leaves than the former, which had comparatively long acuminate leaves. After examining several grasses, sedges, and various introduced weeds, as well as some plants of *Ailanthus glandulosa* (Tree of the Gods), and *Tanacetum vulgare* (Tansy), the two latter having probably escaped from local gardens, the party warmed up "billy," and concluded an enjoyable afternoon's outing with tea and cakes.

E. C.

GALLS OF APIOMORPHA MUNITA.

By Miss A. A. Brewster.

The female galls of *Apiomorpha* munita are about a quarter of an inch high, with four long linear appendages, one from each corner. The appendages are from 2½ to 3 inches long. On some of these are numerous narrow cylindrical male galls On cutting open a gall of the top-shaped female insect, the latter was seen covered with a mealy secretion and resting on its head with its tail upwards. It is thus in a good position to suck the sap of the tissue at the base of the gall. The wall of the latter was white with a mealy secretion, and looked like a little whitewashed room. On examining the insect with a lens, the little cone-shaped legs could be seen well in the case of the hind and middle pairs, but the front legs are much smaller and hidden under a fold of skin. The antennae are short. The front of the head is in the form of a flap with a circular disc in the centre. I could see no sign of the mouth till I mounted a specimen and examined it with the microscope; it is a piercing and sucking type. I took a female out and placed it in a bottle with formalin; it turned up its head and tail and floated on its broad thoracic segments, the mealy secretion keeping it quite dry for several hours. In this position it held its head and legs and sides of the body safely away from the formalin solution.

The male insect is very much smaller, as is the male gall, and it has its legs more strongly developed. Mr. Froggatt points out that the male has no mouth, and this, of course, suggests a very short existence. In most of the male-galls I obtained pupae. The pupa is naked with wing pads in the form of oblong bags. The antennae are long and curved down the sides and towards the front of the body. The pupa also was in an inverted position in the gall. In one case it seemed to be near maturity, because when I moved it partly from the gall by breaking the latter away from the stem, the pupa was standing half way out from the gall, and moving its front legs slowly up and down.

NOTES AND COMMENTS.

SPINE-TAILED SWIFT, *Chactura caudacuta.*—At the June meeting, Mr. Finckh exhibited a specimen of this remarkable bird in a beautiful state of preservation, it having been treated by Mr. Steel by the method described in the *Australian Naturalist* (Vol. IV., p. 99). The specimen was obtained by Mr. Finckh in his garden one morning in an exhausted state. It was placed in a large aviary and fed on mealworms, the larvae of *Tenebrio molitor,* but lived for a week only During this time the bird would frequently rest for hours at a time in an upright position, clinging to a plain stone wall, the feet holding on to the rough surface, and the caudal spines pressing at an angle against the wall and so supporting the weight of the bird.

The finding of this bird and the observations which Mr. Finckh was able to make on the use of the tail spines was a good reward for his habit of strolling about in his grounds in the early morning, as at that time many bird traits can be observed which are not in evidence at a later hour.—Ed.

LIFE HISTORY OF AN UNDETERMINED CICADA.—At the October meeting Mr. Luke Gallard exhibited, and read a note on, a fine series illustrating the life history of a Cicada. Early in September he found some very small larvae about eighteen inches beneath the surface in a moist spot. Further search was rewarded with about two dozen in all stages, representing all the instars except the newly hatched, which is evidently the one figured by Sharp. The next instar shows the abdomen considerably enlarged, and from that on each change brings them a little nearer in shape to the fully developed pupa which we find crawling out of its tunnel. The eggs are laid in furrows cut on the twigs by the female, by means of her powerful anal appendages. When hatched, the tiny larvae fall to the ground and burrow to a considerable depth where they attach themselves to the roots of trees.

Mr. McCulloch's Lecture.

War in the Mangroves.—The subject of the lecture was the Struggle for Existence, as it is to be observed among the animals and plants inhabiting a mangrove swamp. The fact of the world being already full up was considered, and it was pointed out that the myriads of young animals which are constantly being born into it must be introduced to a terrific struggle for their lives even at their earliest stages. Those that survive must be very few in numbers, the greater mass falling victim to, and providing food for, the others already established.

A number of slides illustrated various means and adaptations by which inhabitants of mangrove swamps are enabled to take advantage of the special conditions found there. These included the caudal breathing apparatus and climbing powers of the fish *Periophthalmus,* which chases small crabs, &c., in the hot sun on the mud flats when the tide is out, and even ascends into the lower parts of the mangrove trees in search of food. Also the grill-like apparatus of the crab, *Sesarma,* which is able to utilise the same water over and over again, and so keep its gills moist while it hunts its prey among the branches of the trees. A general account of the crocodile and its nest was illustrated with photos of actual specimens, while various pictures of the mangroves themselves gave a general idea of the conditions under which they grow. Molluscs, insects, and other groups of animals were dealt with in their turn, while a specially interesting set of slides lent by Mr. Baker, Curator of the Technological Museum, showed some aboriginals cutting out their shields from the trunks of the Grey Mangrove, which has certain qualities to render it especially suitable for the purpose.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

April 6th, 1920.—The President, Miss Le Plastrier, in the chair. The attendance was slightly below the average, owing to the proximity of the Easter holidays.

The Right Rev. Dr. Dwyer, Bishop of Wagga, and Mr. R. J. Noble, B.Agr., were elected members of the Society.

Information re the exchange of entomological specimens was communicated to members by Messrs. Froggatt and Finckh. Miss R. Winter exhibited a series of geological specimens from the vicinity of Rylstone, containing fossils. Miss Drummond recognised the fossil as *Glossopteris,* and offered some remarks on its occurrence in the permo-carboniferous. Miss Le Plastrier supplemented a former exhibit of *Loranths* on *Eucalypts,* and exhibited fruits of "Kapok" and *Strelitzia* sp. Mr. L. Gallard read some interesting entomological notes, supplementing his observations with suitable exhibits. Miss Harris exhibited a live seedling of the "Burrawang" *Macrozamia spiralis* from Terrigal, showing precocious germination.

Mr. Finckh read a paper on "The Aquarium: Its History and Management." The lecturer traced the history of the aquarium from its inception. Useful hints were given on the most suitable plants for aquarium purposes, and how and in what media they should be grown. Advice was tendered re the size of tanks and the most suitable fish to inhabit them. A number of excellent slides depicting the fishes in Mr. Finckh's private aquarium, and the arrangement of his outdoor ponds, were screened. A vote of thanks to the lecturer was carried by acclamation.

May 4th, 1920.—The President, Miss Le Plastrier, in the chair, and 42 members present.

A communication was received from Miss Sarah Hynes, requesting the Society to pass a resolution affirming the desirability, in the interests of science, that the Rowan Collection be secured by the Mother State. After considerable discussion, it was decided, on a majority vote, that the matter was outside the scope of the Society's activities. (No expression of opinion was recorded.)

Miss Moulsdale entered a protest against the promotion of excursions by the Society on Sundays. The President read a paper by Bishop Dwyer on "A Floral Survey of the South-western Slopes of N.S.W., round about Temora and Barmedman."

Mr. Hamblin staged an interesting pathological exhibit, including examples of (*a*) Gummosis of the Sugar-cane, (*b*) the infection of plants by Eel-worms, with special reference to the havoc caused by these organisms in the Sweet-pea, Tomato, and Narcissus, and (*c*) the Mosaic disease in Maize, Tobacco, etc., which he considers to be transmittable, and recommends the selection of resistant varieties.

Mr. Matthews exhibited an example of Fasciation in the stem of a shrub which he collected from a copse near Abbeville, France.

Miss McAnene made some observation on the pupation of *Danais menippe* of an interesting character.

Miss Winter exhibited (*a*) an example of floral prolification in *Hypochaeris radicata*, the Perennial Cat's-ear of Europe, locally known as Dandelion. A similar prolific growth is a normal condition in the Hen and Chickens Daisy, (*b*) a series of geological specimens from Rylstone, including an example of Molybdenite, (*c*) two photographic views of a coal seam at Bald Hill, Austinmer.

Miss Le Plastrier read a paper by Mr. T. Steel on the "Food of Rats," in which some interesting observations are recorded, and the conclusions arrived at by a writer who deals with this subject in "Nature," are questioned.

Mr. W. W. Froggatt exhibited (*a*) living examples of full-grown larvae of the Sheep Nasal Fly *Oestrus ovis*, taken from the base of the horn of a sheep killed that morning. Mr. Froggatt mentioned that although the Bots are fairly common in this State, they are only occasionally found in such an active condition; (*b*) an immature specimen of the Crowned Leaf Insect. The adult female is wingless, and is remarkable for its protective mimicry of the foliage among which it feeds.

Miss A. A. Brewster gave an interesting account, accompanied by coloured drawings, of (*a*) Arils on the seeds of "Dogwood" *Synoum glandulosum* and *Cupania anacardioides*, and discussed the function of these peculiar appendages to the seeds, (*b*) the pollination of the Blood-root *Haemodorum planifolium*, which the exhibitor had not yet elucidated, but was of the opinion that the plants were not self-pollinated. A suggestion was thrown out to members to note any insects found visiting this plant; (*c*) sections of the egg masses of Mantis. An explanation of the arrangement of the eggs was given, which demonstrated the keen powers of observation which Miss Brewster had brought to bear on the subject. Miss Le Plastrier offered some observations on the habits of *Eutane terminalis* and mentioned the increasing spread of the Wax-scale. Mr. Froggatt suitably commented on both insects.

The President congratulated Miss A. A. Brewster on her appointment to the position of Deputy-Head-mistress of the Sydney Girls' High School. The members present expressed their approval by acclamation.

The lecturer for the evening, Mr. A. G. Hamilton, was unable to attend owing to a bronchial attack, and our thanks are due to those members who so kindly supplied interesting notes and exhibits at very short notice.

LIFE HISTORY OF DICKY RICE WEEVIL (PROSALIUS PHYTOLYMUS).

By L. Gallard.

Having completed my investigations on the life history of the Apple-root Borer (*Letops Hopei*), as detailed in Mr. W. W. Froggatt's paper in the N.S. Wales Agricultural Gazette, January, 1920, I took up the study of that of the Dicky Rice Weevil, which is a serious pest in our Citrus orchards. As this insect, though only about one-twelfth the size of *L. Hopei*, has in the adult state much the same general shape and habits, it seemed probable that the larvae also would be found to resemble one another in these respects.

The early stages of the Dicky Rice have not hitherto been described.

Attempts to find the larvae by turning over the soil in the nursery of Mr. F. Spurway, Ermington, were unsuccessful. On October 31, 1919, I secured a number of adults which, when confined in a tube with some soil, laid eggs on the side of the tube beneath the soil. These were minute, cylindrical, slightly oval, and of a darkish amber colour. On December 1st two young had hatched. They were white, legless, hairy grubs about 1 mm. in length, and were able to move about freely by means of their mouth and by muscular contraction, aided by a sucker-like anal appendage. The mature larva possesses a crown on the dorsal surface of the anal segment consisting of a circle of long reddish bristles which forms a marked characteristic. This was not visible on the newly-hatched larvae, but as these grew older it could be be detected under the microscope, some of the hairs being turned backwards. On December 9th I secured a large number of the mature insects which were pairing freely, and which laid numerous eggs.

On January 2nd, by digging at a spot where some stocks were growing, at a depth of 9—12 inches, I found a number of pupae and larvae, the latter showing the anal crown very clearly.

Coming out during the spring and February growths, the mature insects attack the young shoots on the orange trees, in many cases eating the crown right out and in others so damaging the shoot that its growth is stunted and deformed. The young tender leaves are eaten all round the edges, and the surface chafed in extensive patches. When the older leaves are attacked they are eaten round the edges, leaving them irregular and scolloped. The young fruit is also attacked, the outer surface being nibbled off in irregular patches and lines, which, as the fruit ripens, become brown and rusty, and though the fruit is quite sound internally, it is rendered unsightly and practically unsaleable.

Young trees, when badly attacked, do not make proper growth, and will stand in the nursery for two years without increasing a foot in height. This, which was formerly a puzzle, we now know to be due to the attacks of the larvae on the roots.

By washing the roots of damaged young trees, I have seen the chafing and corrugations caused by the attacks of the larvae. In this respect the damage to the roots closely resembles that caused by the larvae of *L. Hopei*, but those of *P. phytolymus* are so much smaller that their work is not so readily detected.

There are evidently two broods in the year, the main emerging months being October-November and February-March.

REPRODUCTION OF PLANTS FROM LEAVES.

By A. A. Hamilton.

A peculiar form of vegetative reproduction—a habit which has suggested to the author the generic name for the plant—is a normal condition in *Bryophyllum calycinum,* a member of the "House-leek" family (*Crassulaceae*), indigenous in the Malayan Archipelago, and widely cultivated as an ornamental garden plant. When the fleshy leaves commence to decay and foll from the plant, adventitious shoots emerge from the crenatures of the leaf margin. The specimens of leaves exhibited were placed between sheets of paper in the customary manner for drying, and it will be noted that the shoots, which emanated from the leaves during the process, are blanched (etiolated) as a result of growing in the dark. In a paper, "The Reaction of Leaves to Traumatic Stimulation" (Wounding) (Ann. of Bot., Vol. 15, p. 533), the authors note that the cut-off leaves of the Oleander (*Nerium Oleander*) invariably put out vigorous crops of adventitious roots from the stump of the leaf-stalk if kept in the dark and supplied with water. The capacity for the production of adventitious buds on their leaves is inherent in several herbaceous garden plants, e.g., Begonias, Gesneras, &c., and certain Ferns, and is occasionally used by the horticulturist to propagate the species. The detached leaf is mutilated to stimulate growth and pegged down or laid, lightly covered, on damp said. E. J. Salisbury (Ann. of Bott., Vol. 29, p. 309) figures the occurrence of buds arising from the leaves of several species of the "Sundew" (*Drosera*), which developed into independent plants upon the fallen leaves. The Sundews, which were taken from a pond, developed this abnormality under cultivation in a greenhouse. Probably the best known example of this form of vegetative reproduction occurs in the Prickly Pear (*Opuntia*). In the Gard. Chron. for September, 1888, p. 328, a figure is presented of a fruit of an *Opuntia* showing roots emitted from its base and shoots, representing segments of the stem (cladodes) arising from its apex, after the fall of the corolla and stamens.

In a note on Non-sexual Propogation in *Opuntia* (Bot. Gazette. V. 31, p. 127), C. E. Preston, of Harvard University, draws attention to *Opuntia arbuscula,* whose fruits, though produced in abundance, contain few fertile seeds. The heavily-laden branches bend over to the ground, and in this position new shoots arise which give off roots into the soil. The process is described by the author as being analogous to the horticultural operation known as "layering." At a recent meeting of the Linn. Soc. N.S.W. (July, 1919), the writer read a note on vegetative reproduction by means of adventitious tubers, and referred to the views expressed by various workers engaged in the investigation of this phenomenon. The concensus of opinion pointed to vegetative reproduction as a response to sexual infertility, and either interference with the root growth, or a sudden and exacting change in the environmental conditions, as the stimulating factor in this abnormal habit. An example of the latter occurrence was noted on the removal of some plants of the "Lotus," *Nymphaea lotus,* from their native habitat at Lake Nyassa, where the insolation is extreme, to a shaded and sheltered position in a greenhouse at Kew Gardens, which resulted in the production by the plants of aerial tubers in the place of flowers. The adventitious tubers produced by the lotus are the equivalent of the plantlets formed on the leaves of the sundews, when transferred from the inclement environment of the pond to the luxury of the conservatory.

PSEUDOMUGIL SIGNIFER IN THE AQUARIUM.

By H. E. Finckh.

I am pleased to report the successful transporting home and the acclimatisation to aquarium life of the Blue-eye *Pseudomugil signifer,* which I netted at the Duck River excursion.

This, our smallest and very beautiful little freshwater fish, so admirably suited for the aquarium, is most difficult to handle.

Even with great care a very small proportion, if any, of those caught at certain times during the year, survive. I have been making notes of my various catches during many years, and find that I have only been successful during midwinter months, then only losing about 5 %, whereas a save of 15 % at other times is almost good. Of the catch at Duck River I only lost 6 out of 30. I repeated the experiment 14 days later with similar results.

This success may be due to the mild summer which we have experienced.

After a few days in the aquarium it becomes very tame, and lives for years.

ON RICCIA FLUITANS.

By H. E. Finckh.

At the February meeting I exhibited a fine bunch of this rare and beautiful plant, which I was fortunate enough to have raised from some stray fragments which were floating in a fish bowl in which I had landed aquarium fish from the United States of America.

This floating plant in colour as well is in shape, is a fine addition to a fishtank, so different from anything else amongst the floating plants, besides it is most helpful in the rearing of young fish. Its ball-like mass of separate plants affords an ideal hiding place for the young fish; in this they seek protection from their enemies, which very frequently are their own parents.

I am endeavouring to raise the terrestrial form, which should prove an interesting exhibit.

I am indebted to our President for the following information regarding the plant: The genus Riccia is made up of small plants, which nearly always form more or less complete rosettes on soil. Some species are monoecius, others dioecius. *R. fluitans* has the former habit. It grows in thin sterile patches, floating in stagnant water, or frequently in fertile layers on mud, green or yellow-green. It is recorded from Black Spur and near Marysville, Gippsland, Victoria.

OBSERVATIONS ON LARVAE OF DANAIS MENIPPE.

By Miss M. McAnene.

We had three Danais larvae under observation for three weeks. On the 23rd April two caterpillars attached themselves to the top of the box within about half an inch of each other. As they always hang head downwards, completing the cremaster necessitated a fair amount of turning or twisting. Occasionally in the wriggling, one would appear to move in too close proximity to the other. The disturbed one immediately jerked its body in quite a fierce-looking manner towards the offender. This continued for more than three hours. We wondered if the seeming ferocity was a form of protective mimicry. Next morning the chrysalids were quite complete, facing in opposite directions—one towards the light, and the other towards the back of the box.

On 27th April the third caterpillar moulted, and attached itself to the top of the box, about an inch from the other two—the last larval skin falling to the bottom of the box within 12 minutes of the commencing of the cremaster.

FLOWERS OF HAEMODORUM, BLOOD ROOT.

By Miss Agnes A. Brewster.

In this seemingly insignificant "black" flower there are some very interesting points to be noted. There are 6 perianth segments (3 sepals + 3 petals). There are 3 stamens, and each anther has 2 lobes; each lobe splits down the inner margin so that the pollen is shed on the *inner* side. The pollen ripens before the stigma, and the anthers begin to dehisce before the flower opens. As the flower matures, the style elongates, carrying the stigma well above the pollen. Later the flower opens to a very limited extent, and this is due rather to the elongating and narrowing of the sepals and petals than to any unfolding of the flower. At this stage the style grows rapidly, carrying the stigma right up through the small open space above till it is quite outside the perianth and ready to be touched by visitors.

I have not seen visitors on this flower, but the ovary bulges at the apex to form nectaries, and there is abundant nectar so that honey-lovers must be the visitors. The ovary is rather interesting in that it seems to be half-way between the inferior and superior ovary. I would be glad if some members living near the bushlands would watch for the visitors to this flower.

EXCURSION TO MR. FINCKH'S AQUARIA.

Saturday, April 10th, was a notable day to the large party of members and friends, who, by invitation of Mr. Finckh, visited his beautiful grounds at Mosman and inspected his very fine aquaria. The grounds are laid out with a series of 22 artificial ponds constructed of cement and sandstone, in which the fishes are kept in most comfortable natural surroundings, with a luxuriant growth of suitable aquatic plants. In various rooms and trellis houses are a large number of glass-box aquaria, containing those fishes, etc., which are best suited for this method of housing and display. In these, amidst graceful water plants, the fishes live in the utmost comfort, free from the persecution of enemies, and well fed and tended by their kind-hearted owner. To many of the visitors the whole scene was a revelation. Mr. Finch demonstrated the feeding of his pets on grated raw meat and powdered dried Mexican shrimps, a proceeding which was watched with the greatest interest. Amongst the water-plants were *Vallisneria, Elodea, Tillaea recurva, Ceratophyllum demersum, Ceratophyllum submersum, Ludwigia, Sigittaria, Fontinalis, Nitella.* Floating plants: *Azolla,* various *Lemnae, Riccia fluitans, Wolffia,* and various beautiful water-lilies.

Of Australian fishes the ponds, etc., contained *Krefftius adspersus, Carassiops compressus, C. gallii, Pseudomugil signifer, Melanotaenia nigrans* (Atherine), *Ambassis agassizi* (Chanda perch), *Galaxias scriba.* Of exotics, *Macropodus viridi-auratus* (Paradise fish), *Orizias latipes* (Medaka), *Jordanella floridae, Gambusa affinis,* and a great number of Golden Carp, amongst which were some fine specimens of the Japanese Fantails.

The terrestrial plants surrounding the ponds are all selected to suit their environment, not the least interesting of those in the bush-houses was a fine example of the Royal Fern (*Osmunda regalis*), while a magnificent towering *Euphorbia* in the grounds attracted much attention.

In the aquaria the crystal clearness of the water and perfect growth of the aquatic plants were very noticeable.

Most of the exotic fishes were imported by Mr. Finckh, and were the first of their kind to reach Australia. They came from Bravil, Mexico, Barbados, Florida, Trinidad, Venezuela. and U.S.A., also Singapore and the East.

The interesting viviparous tooth-carp family was represented by *Lebistes reticulatus* (in colours like a living opal), *Limia caudofasciata, Gambusia holbrooki,* and the wonderful *Xiphophorus helleri* (Mexican swordfish), with the lower rays of the caudal fin drawn out sword-shaped as long again as the whole body of the fish; this fish is also most gorgeously coloured. This is the first season in which Mr. Finckh has succeeded in breeding *Xiphophorus,* and the young born in September have matured and reproduced young in six months.

The oviparous species shown were *Betta pugnex* (Siamese fighting fish), *Ctenops vitatus* (Croaking Gurami), *Lepomis pallidus* (Sunfish), *Anabas scandens* (climbing perch), and *Jordanella floridae.*

All the viviparous species have been successfully bred, and it is a most interesting sight to see 100 or 150 of these beautifully coloured fish congregated in a small aquarium and crowding to the front to be fed.

All the tropical fish are housed in specially constructed aquaria, which during the winter months are heated by a small lamp beneath. The total number of fish in the collection is between 1500 and 2000, and a most noticeable feature is their extreme tameness, testifying to the enlightened treatment of their owner.

The remarkable Mexican *Axolotl,** the tadpole or so-called laval stage of the Salamander *Ablystoma tigrinum,* which possesses gills, and for some unknown reason breeds in this stage, though it ultimately loses the gills and passes into the gill-less mature state, was represented by healthy specimsns. The Californian "Water-dog" *Diemyctylus torosus* was also shown.

Various newts and several examples of the giant toad *Bufo vulgaris* var *japonicus,* were in a thriving condition. The toad eats snails, and will only touch these when living. When a snail (*H. aspera*) was placed in front of the toad the latter gazed fixedly at the snail for about a minute, and then with a lightning-like flick had the snail in its mouth, then with a second flick swallowed it whole.

Of that lovely and extremely rare bird, the Kagu (*Rhinochetus jubatus*), known only from New Caledonia, there was a number of specimens, which came forward with most graceful antics to feed on snails. Twenty years ago these birds laid an egg and then another, as up to that time the egg was unknown to science; Mr. Finckh presented them to the Australian Museum. They were figured and decribed in Records Aust. Mus., Vol. iv., 1902. After 16 years' effort a chick was successfully reared, and thus the life history of the bird became known. The chick was figured and described in "The Emu," Vols. iv., v., and xiv. It is interesting to note that a photo. of this charming bird sent to Paris by Mr. Finckh was used in designing the New Caledonia postage stamps.

Two fine healthy tortoises, *Testudo radiata,* were objects of much interest, feeding on fruit. Some extremely tame "Jackasses," parrots and other birds were amongst the pets. The methods of breeding live food for the fish, such as the larvae of *Enchytraeus albides, Daphniae,* and Mosquito larvae, were explained in detail.

Very much of what was on display is rarely if ever to be seen elsewhere, and obviously Mr. Finckh's notable success is due to his never attempting to keep anything in captivity unless he can give it every comfort, and as near natural conditions as possible, and to the infinite pains which he takes in attending to every detail personally. Mr. Finckh's hobby is a labour of love, and he fully deserves the eminent success which he has attained.

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* Mexican, Play in the water.

Mr. Finckh asks us to say that he much regretted that, owing to the large number of visitors present, he was unable to do justice to all, and he would be pleased to show round smaller parties, who are asked to communicate with him so as to make appointments and so prevent disappointment.

Mr. Finckh was most generous in giving members of the party plants, etc., with which to make a start, and he will gladly assist with information and advice any of our members who may desire to take up so delightful a hobby. The visitors were hospitably entertained by Mrs. and Miss Finckh with afternoon tea on the lawn.

Miss le Plastrier, President, thanked Mr. Finckh most cordially for giving the members so delightful an afternoon's treat.

T.S. C. M. le P.,

EGG MASS OF SMALL MANTES (ORTHODERA).

By Miss Agnes A. Brewster.

This egg mass is smaller than that of the genus *Archimantis*, for it is not enclosed in the thick spongy enveloping tissue present in the larger egg mass.

I cut cross and longitudinal sections through the smaller egg mass, and found that the eggs were placed in little compartments, the latter being in two rows. In each were four eggs (on an average), and as there were six full-sized compartments in each row, there were 48 eggs in the main part of the egg mass. The latter tapered at each end; thus the end compartments were smaller, each containing only 3, 2, or 1 egg. The total number of eggs was 59. The eggs were elongate and placed vertically in the compartment; the latter narrows above to form one opening for each little egg-room so that the four baby mantids emerge by one common door, which opens on to the upper, outer surface. This narrowed door is filled in with a plug of spongy material which must be cut through by the emerging mantis, and the first out has the hardest task. The whole of the compartments are enveloped in a thin layer of protective tissue. On the egg mass examined there were eleven pairs of doors opening on the surface and an odd one at each end.

ABNORMAL BRANCHING IN A PALM.

BY A. A. HAMILTON.

A plant of the Curly Palm (*Howea Belmoreana*) with an abnormally forked stem is at present growing in the apex of a plantation in the vicinity of the entrance gates to the Garden Palace grounds, Sydney. There is no evidence of injury, and the position of the branch indicates its derivation from an axillary adventitious bud rather than apical division of the stem (meristematic dichotomy). A branching habit from either the horizontal (rhizomatic) or aerial stems is the normal condition in the majority of palms, the genera in which individuals are restricted to a single unbranched stem being comparatively few. The Sago Palm (*Metroxylon sagu*), which forms dense forests in muddy tidal marshes in the tropics, is renewed vegetatively, the fleshy rhizome which lies slightly embedded in the soft mud producing aerial stems at intervals. The latter are several years attaining maturity, when they flower, fruit, and die (monocarpic). Worsdell (Principles of Plant Teratology, v. i., p. 110, 1915) suggests that branching is an ancient feature in palms, and abnormal occurrences of this habit may be regarded as reversions. In a paper on "The Phenomena Concerned in the Production of Forked Palms," Morris (Journ. Linn. Soc., V. xxix., p. 281, 1892), gives a list (p. 286), of 10 genera in which abnormally branched palms have been observed, including the Nikau Palm of New Zealand *Rhopalostylis sapida,* and in an added note (p. 298) refers to a plant of *Livistona humulis* R. Br., with four distinct branches, mentioned by Maurice Holtze in a "Narrative of an Exploring Expedition across Melville Island, north of Port Darwin." (Trans. Roy. Soc. S.A., V. 15, p. 117.) Morris comments, "This is apparently the only instance of a branched palm in Australia." Ridley, on "Branching in Palms" (Annals of Botany, xxi., 415, 1907) adds six genera to the list compiled by Morris, in which abnormal branching is known to have occurred. The genus *Howea* is not included in either of these lists, and the plant under review provides a new record of this rare occurrence in Australian Palms. The most obvious morphological distinction between the Curly Palm and its congener, the Flat or Thatched Palm (*H. Fosteriana*) is the arrangement of the segments of the leaves, those of *H. Belmoreana* converging upwards and giving the leaf the curly twist implied by its popular name, while the leaf segments of *H.*

Fosteriana exhibit a drooping tendency. Both palms are growing in juxtaposition on either bank of the creek flowing through the Middle Garden, where it crosses the path running parallel to the line of hot-houses, and may be readily recognised by the distinctive growth habit of the leaf segments. In the majority of instances in which abnormal branching has been noted this condition has developed in cultivated specimens.

POLLINATION OF PERSOONIA LANCEOLATUS BY THE BEE HALICTUS.

By Miss Agnes A. Brewster.

After careful observations covering several years, I was at last successful in seeing the useful visitors to the flowers of the Geebung (*Persoonia*), at least in the case of the species *lanceolata,* and from the general structure of the *Persoonia* flowers it is probable that bees are the visitors to all.

Large clumps of *Persoonia lanceolata* were found growing at Clarence siding, Blue Mts., and on the very hot days of January I found the flowers alive with the short-tongued Andrenid bee, *Halictus* sp.: it is a medium-sized black bee, with very hairy legs. The bee alights on the flower, and in seeking the nectar, it clings to the pole-like style, and as it struggles for the nectar the body rubs against the stigma and the style: the latter is covered with adhering pollen, and is brushed on to the under side of the bee, which causes cross pollination to take place. The nectar is secreted by four beautiful club-shaped nectaries just below the ovary. The pollen is carried by means of the hairs of the back legs, and the mass is held in position between the thigh or femur, the tibia, and the body. I examined the so-called "gathering hairs" found on most bees, and found they were most highly developed on the back legs, on the tibia. Comparing them with those of the hive bees (*Apis*) and the leaf cutter, *Megachile,* the little branches of each hair were three times as long as those on the latter.

It is interesting to compare the pollen basket of *Apis* with the pollen-holding apparatus of *Halictus.* In the former the pollen basket is smooth, and broad on the outer side where the pollen is carried, and on the edges, is a simple fringe of spine-like hairs to keep the pollen in place. In *Halictus* the pollen is carried on the hairs of the tibia and femur or thigh, and the mass of it is held by these parts close to the body—the bee having the appearance of a boy holding a large yellow mass under each arm. The gathering hairs are most highly and thickly developed on the tibia, where they are long and soft, looking like slender stems with branches (under the miscroscope). At the base of the tibia are two large beautifully- toothed spines which act as stays to hold the pollen mass in position. Gathering hairs are also found on the head of this bee, but the branches are smaller than those on the legs.

The gathering hairs of the little social bee *Trigona* differ markedly from any of the former, though the general structure of the legs is identical with those of the hive bee. These gathering hairs are not long and soft, but very stiff, and with stiff branches only near the apex—the outer branches of each hair are much shorter than those on the inner side.

The short sucking mouth of *Halictus* is a very beautiful object under the microscope. The labium or inner maxillae form a solid central mass, the palpi are reduced to short pad-like structures with fringes of hair. The outer maxillae are padlike and fringed, but the palpi are 5-jointed and so clear and strong as to give the palpi the appearance of polished-looking antennae. The mandibles are strong and plate-like with a prominent tooth on the inner edge.

LARVAE OF TISAPHONE ABEONA FEED ON CLADIUM JAMAICENSE.

By Miss Rose M. Winter.

When at Duck River (Auburn) on the 7th February, 1920, a clump of *Cladium jamaicense* was found growing on the water's edge near the bridge. Being anxious to know whether the larvae of *Tisaphone abeona* (the Wood Brown Butterfly), which feed on the common Sword-grass, would eat *C. jamaicense,* I cut off several long pieces and took them home. The long leaves were put in a large pickle bottle with a little damp earth in the bottom and several larvae of *T. abeona*: the bottom portion of a Wills tobacco tin inverted over the mouth of the bottle formed the lid; no special ventilation was provided.

On the 2nd March the pickle bottle and contents were exhibited at the meeting. The bottle still contained what was uneaten of the *C. Jamaicense* in good condition; two of the larvae put in on the 7th February were still feeding on it, and one had pupated. This proves that *T. abeona* larvae will eat and thrive on *C. jamaicense.* It also proves that Sword-grass will keep fresh in a bottle under conditions mentioned above, for over three weeks.

When keeping larvae on common Sword-grass, as well as on *C. jamaicense,* I never cut the long leaves into lengths to fit the bottle, but merely fold them and crease them at each fold, being careful that the side which has a tendency to curl inwards when on the plant, is put outside. When treated in this way, the leaves do not curl, and will remain fresh enough for larvae to eat for three weeks or a month, so that *T. abeona* may be bred out easily by those who have little time to spare, or who have not the Sword-grass growing handy.

TRANSFORMATION OF THE SAW FLY (PERGA DORSALIS).

By C. T. Allen, Public School, Walli.

One evening in December, when accompanied by some of the children, we noticed about twenty saw-fly larvae crawling down the trunk of a gum tree. The grubs were about four inches in length and about one inch in circumference. On reaching the ground they kept closely together, beating the ground with their tails as they crawled, and at the same time emitting a peculiar yellow fluid from their mouths. By means of a spade, the grubs were placed in a box containing soft earth and covered with a glass lid. By next morning they had all burrowed beneath the soil.

One morning in May a peculiar sharp humming sound was heard to come from the box, and on looking through the glass we saw three large brown flies struggling upwards through the soil. In about half an hour a dozen more made their appearance; they were very handsome and strong, with large eyes. On some fresh gum leaves being given them, the flies commenced eating these almost immediately. On taking the box to the open air and removing the cover, the flies flew away with a loud humming noise. Emptying the earth out of the box, we found the empty cases, which were about 1½ inches in length, dark brown in colour. One end of each cocoon was punctured with numerous small holes, perhaps for the purpose of admitting air.

NOTES AND COMMENTS.

Larva of Eucnemid Beetle.—At the December meeting Mr. L. Gallard exhibited a peculiar coleopterous larva which he had found when digging at Eastwood. Subsequent examination of the mature beetle showed it to belong to the Eucnemidae or False Click Beetles. The colour of the larva was creamy, and the integuments rather hard. The head was a hard shovel-like process, slightly serrated, and resembling the labrum of a scarabid beetle. Neither legs nor mouth parts could be detected, even on microscopic examination, but a pair of small black tractile mandibles or sucking styles could be traced.

A larva which was found on September 10, 1919, cast its skin on October 28, assumed the pupal state, and hatched out a perfect beetle on November 30.

INSECT BITE.—In Pitt-street, Sydney, one day in summer I felt a sharp puncture on the back of the hand, and found a Rutherglen Bug (*Nysius vinitor*) apparently sucking blood. I captured the insect, which was identified by Mr. Froggatt. On another occasion, some years ago, one of my boys caught a variegated plant bug about three-quarters of an inch in length, which promptly inflicted a sharp painful puncture. Unfortunately the insect was lost, so I was unable to identify it.

T. STEEL.

Macrozamia Seedling.—Miss Harris exhibited at the April meeting a seedling which grew from a seed brought from Terrigal in April, 1919, and thrown out. This one took root on a strawberry bed. It is remarkable because it came up in a year, while the usual time for germination is two years.

Exchange of Specimens.—At the May meeting Mr. Froggatt read a letter from Mr. T. J. Dennis, Owensmouth, Los Angeles, California, asking to be put in touch with persons in Australia desirous of exchanging Australian Lepidoptera for Californian species.

ERRATUM.—Vol. iv., p. 134, line 8 from top: For "tractiopod" read "brachiopod."

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

June 1st, 1920. The President, Miss Le Plastrier, in the chair and 47 members present.

A communication from the Field Naturalists Section of the Royal Society of South Australia containing a request for New South Wales Native plants for a Wild Flower Show, to be held in October, was read.

Miss Drummond exhibited specimens of *Marchantia* from Hornsby, growing on decomposed volcanic breccia, which displayed a more luxuriant growth than plants from the poorer soils near Sydney. The exhibitor gave a brief geological description of this interesting volcanic formation and its composition.

Miss Le Plastrier furnished some interesting information relative to a series of specimens from Leeton and Griffith, forwarded by Bishop Dwyer.

The President read a paper by Mr. T. Steel F.L.S., on the Mound Ant, *Iridomyrmex detectus,* Mr. Steel's observations show that these insects collect a large quantity of material from various sources to place on their nests. Small gravel of different kinds, fragments of cinders and other objects, from the mounds were exhibited in illustration. The Secretary read notes forby Mr. Kieth C. McKeown, from the Murrumbidgee Irrigation gation Area on the occurrence of the Aurora Australia as seen at Leeton, and entomological observations on the Bag Moth and the Mound Ant.

The meeting resolved that a letter be sent to Professor J. T. Wilson, M.B., Ch.M., a member of our society, congratulating him upon his appointment to a distinguished position at Cambridge University.

Mr. A. G. Hamilton gave an interesting address on the relations of plants and birds. The lecturer showed that birds are indebted to plants for food and facilities for resting and nesting. In return they afford a measure of protection to the plants from the attacks of insects and assist in the work of pollination. Mr. Hamilton exhibited an exhaustive series of slides to illustrate his remarks. In moving a vote of thanks to the lecturer Mr. Froggatt related several incidents descriptive of the habits of the birds at the Sheep-fly experiment station at Moree. The motion was seconded by Miss Busby, who made some observations on the birds in her own aviary. The vote of thanks was carried by acclamation.

MACROZAMIA OR BURRAWANG.

By Agnes A. Brewster.

This plant is a cycad belonging to the Family Cycadaceae, which are naked-seeded plants or Gymnosperms. *Macrozamia* has an enlarged root-stock, and roots which bear bacterial nodules. The leaves are tough and pinnate. The male and female cones are borne on separate plants.

The Macrozamia plant is the *sporophyte* or asexual generation. It produces the cones or sporophores (spore carriers).

The *female cone* (Fig 1) consists of a central rachis which is strong and woody. On this are found a number of stout, spined carpels or sporophylls (leaves carrying spores), which are arranged spirally. Each carpel bears two *ovules* or macrosporangia (Fig. 2).. If a longitudinal section of this ovule is cut the following structures will be seen (Fig. 3); (*a*) the walls of the ovule called the *integument,* which protects the inner parts. At the apex of the integument is a narrow passage, the (*b*) *micropyle,* and the position of this can be identified by a tiny projection on the apex of the ovule. It allows the entrance of the pollen grains. Within the integument is a zone of tissue of many cells which is called the (*c*) *nucellus* (Fig. 3): this acts as a food store, and also protects the innermost part (*d*) the *embryo sac* or macrospore, which contains (*e*) the *prothallium* or *gametophyte*: it is multicellular, consisting of numerous delicate cells in which *archegonia* or female gametes are embedded at the apex: the neck cells of the archegonium of mosses is reduced here to a couple of cells. Note that whereas in Mosses the whole moss-plant body is the gametophyte, in Macrozama it is reduced to this soft jelly-like tissue within the embryo-sac, and it never leaves the ovule or macrosporangium. The *male cone* has a central woody rachis on which are placed the *microsporophylls* or *stamens* (Fig. 4). Each bears two groups of numerous tiny sacs about the size of a pin's head, called *pollen sacs* or microsporangia; they contain microspores or pollen grains (Fig. 4). Within the pollen grain or microspore is the male gametophyte, but reduced to but a few cells. After the germ tube of the pollen grain grows, and it is ready for fertilisation, there are within the tube two generative nuclei. These nuclei are, in most Cycads, motile, swimming about in the fluid of the pollen tube by means of a spiral band of cilia. When the pollen is carried by wind to the ovules of the female cones, it falls through cracks between the sporophylls and reaches the micropyle of the ovule. A drop of sticky fluid at the apex of the micropyle catches the grain, and on shrinking draws it down to the pollen chamber—a little narrow elongate cavity between the integument and the nucellus. Here the pollen grain germinates, sending out the pollen tube, which sets free the motile spermatozoids. One enters an archegonium, and fertilization takes place by union of this cell with the oosphere of the archegonium. A *seed* results.

The Seed (Figs. 5 and 6).—The embryo consists of two elongate cotyledons (Fig. 6), plumule and radicle. This embryo is embedded in a mass of endosperm or food store (Fig. 6). The testa of the seed consists of three parts: (1) Fig. 5. (*a*) Outer skin, of bright red or yellow colour. (2) (*b*) Inner soft pulp of cream colour. (3) (*c*) Hard woody "nut" immediately surrounding and protecting the embryo.

The function of the pulpy mass and bright, outer testa would seem to be either:—

(1) To attract animals to eat the pulp and carry away the seeds, or (2) the pulp forms a soft mass of natural manure to give a start to the germinating embryo.

Germination.—On germination, the radicle grows rapidly through a weak place at the base of the hard nut, and pushes deeply down into the soil, a young root being usually six inches long before the plumule appears.

The root is thick and fleshy, and seems to absorb a large quantity of the food supply stored in the endosperm of the seed.

This is absorbed by the upper part of the cotyledons, which remain within the endosperm and send the food on to the growing plant (Fig 6). Later the first leaf appears, and for some time the cotyledons are still absorbing the food store within the nut.

Later the cotyledons fall.

The presence of curious vertical aerating roots has been recorded previously in this Journal.

Note that the free swimming spermatozoids or generative cells of the pollen grain are the last trace of the algal ancestry in the higher plants. These motile sperms were discovered by a Japanese scientist. This discovery forms an interesting link in the chain connecting the higher and lower plants.

DAWSONIA POLYTRICHOIDES, A HARDY MOSS.

By Agnes A. Brewster.

Mosses are descendants of certain algae, and are interesting because they show stages in the evolution of plants from an aqueous existence to that of land conditions. They develop stems in order to support chlorophyll-bearing organs or leaves. Then special areas must be set aside for the carrying of raw-food material up to the leaves, and for taking the elaborated foods made in the leaves, away to other parts: thus differentiation of tissue is produced. But the special structures thus formed are very simple compared with those of higher plants.

Dawsonia is a sturdy moss which can be found growing on the roadside, or in more sheltered conditions. It shows more complexity of structure than most mosses, which enables it to weather through moderate drought conditions.

If a cross section (Fig. 1) of a stem be taken the following can be seen: (*a*) A central cellular area with thickened walls containing some very specially thickened and pitted-walled cells, called *tracheal cells.* This central area is called the *hydrome,* and is surrounded by a ring of thicker cells called the *hydrome sheath.* The hydrome conducts the raw food material from the soil.

(*b*) Surrounding the hydrome is a zone of tissue which conducts the elaborated food made in the leaves, down to the other parts. It is called the *leptome.*

Outside the leptome is the (*c*) cortex which forms a protective covering, and whose cells may store food. In the cortex are primitive "veins" leading into the leaves; such are called *leaf traces* (Fig. 1d).

The leaves (Figs. 2 and 3) are crowded and imbricate (Fig. 1), and are sheathed at the base; they taper towards the apex; the margin is serrated. If a cross section (Fig. 2) of a leaf be cut, there can be seen (*a*) vertical rows of cells called lamellae; (*b*) below these is the blade or lamina. The apical cell of each lamella is enlarged and colourless, while the others contain chloroplasts. These lamellae are the chief organs of photosynthesis (manufacture of foods). The cells of the lamina or blade are chiefly conductive in function, though a few chloroplasts occur in the outer cells.

The leaves are specially adapted for xerophytic conditions. When dry weather prevails the leaf curls round the stem, bringing the upper colourless cells of the lamellae together, so that a curtain is formed to prevent too rapid transpiration. On applying water to the dry stems, the leaves uncurl and the plant freshens up within 20 minutes.

The aerial stem is continued below the ground to form a rhizome, which is covered with a fur of thickly matted rhizoids.

Dawsonia is dioecious, the male and female "flowers" being on separate plants. The male flower-clusters consist of rosette-like structures at the apex of the stems (Fig. 4). On the edges are rows of short leaves: In the centre are numerous pear-shaped multicellular *antheridia* (Fig. 5), which contain motile flagellate antherozoids. Between the antheridia are numerous paraphyses which are multicellular, and at the apex broaden out into several rows of cells. Chloroplasts occur in the walls of the antheridia.

The female flowers (Figs. 6 and 7) are like ordinary buds in outward appearance, hence are very hard to find. I had to dissect dozens of buds before discovering any of the archegonia. I found only a few archegonia on each plant: the neck of the archegonium was extraordinarily elongate, and the oosphere or egg cell very small.

The paraphyses are long and multicellular, but differ from those of the male in being of one cell in thickness throughout.

As fertilization occurs by means of water, *Dawsonia* retains one character of its algal ancestry. The antherozoid swims through moisture, enters the neck of the archegonium and reaches the egg cell or *oosphere*, and fertlisation takes place. The resulting cell or *oospore* produces the sporophyte or spore-producing plant, which is the asexual generation. In mosses, this is partly parasitic on the gametophyte or Moss Plant.

The *sporophyte* (Fig. 8c) consists of (*a*) the stalk or *seta,* (*b*) the *capsule,* whose structure can be seen by cutting a cross-section (Fig. 9). Working from the outside is (*a*) the wall of several layers of cells: (*b*) next is an air chamber with numerous multicellular strands or trabeculae containing chloroplasts; these extend from the wall to the (*c*) spore-sac, a narrow, cylindrical sac, which in the young capsule encircles a solid central axis, called (*d*) the columella. In older capsules the columella is practically hollow, for the spore-sac and outer layers of the columella grow more rapidly than the central part of the latter, and it becomes torn into strands (trabeculae) similar to those in the outer air chamber.

If we examine the young capsule, a curious hood-like structure is seen to cover the whole sporophyte: it is called the Calyptra (Figs. 8 and 10), which is the remains of the wall of the archegonium. Numerous long, yellowish-brown hairs cover the rather small bonnet-like Calyptra-proper, and these clothe the capsule.

As the seta elongates the Calyptra is torn away and carried up with the capsule: the seta curves over so that the capsule is placed in a horizontal position, and it is now concave above and convex below.

When mature, the Calyptra falls off, exposing the little operculum or lid of the capsule (Fig. 11): it is shaped like a dunce's cap. Later the operculum falls, and then a brush of fine white bristles is seen projecting from the edge of the mouth of the capsule. This brush is called the *peristome* (Fig. 12), and its function is to aid in dispersing the spores, for the bristles are hygroscopic. These bristles are not hairs, but represent rows of thick cells, between which the weaker bands have become torn away. At this stage the water and food supplies are cut off from the sporophyte, and the capsule dries, and consists practically of wall, spore-sac and peristome.

The spores may be removed partly by the aid of water, for the groove in the upper concave surface would make a little gutter for rainwater to run down and carry away some of the spores.

An interesting point is that the male "flower" is probably not truly terminal, for the axis is continued upwards through the rosette in a series of tiers, showing 3 or 4 generations on one stem.

Plate iii.

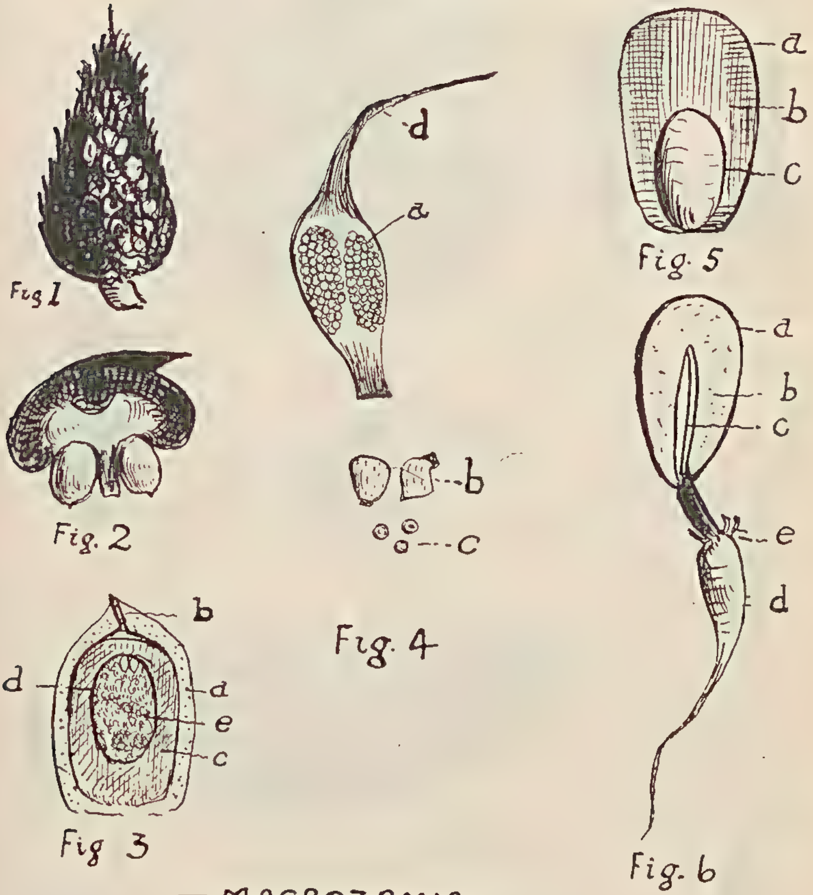

Fig 1

Fig. 2

Fig 3

Fig. 4

Fig. 5

Fig. 6

— MACROZAMIA —

Plate iv.

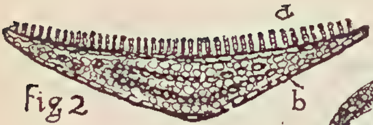

Fig 2

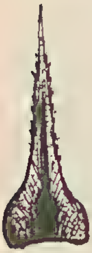

Fig 3

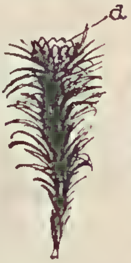

Fig 4

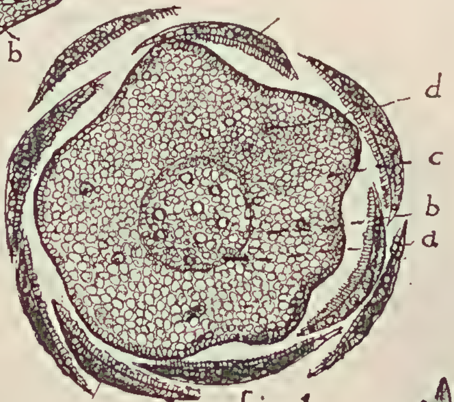

Fig. 1

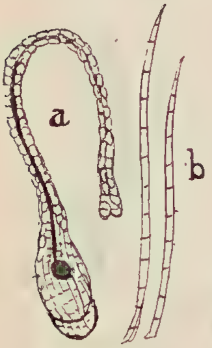

Fig. 7

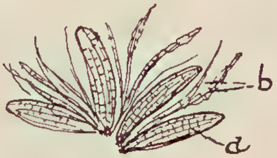

Fig. 5

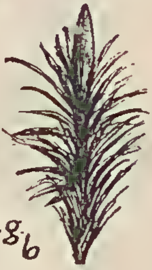

Fig. 6

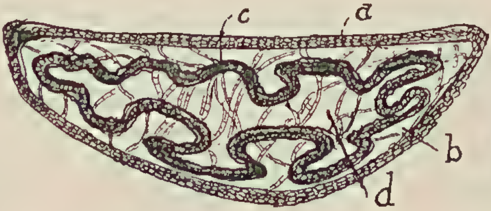

Fig. 9

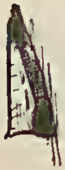

Fig. 10

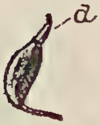

Fig. 11

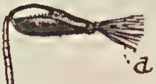

Fig 12

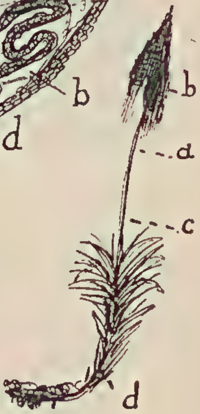

Fig. 8

DAWSONIA

EXPLANATION OF PLATES

Macrozamia. Pl. iii.

Figure 1.—Female Cone (reduced).

Figure 2.—Carpel with Ovules.

Figure 3.—Longitudinal section of ovule—a. integument, b. micropyle, c. nucellus, d. Embryo sac, e. prothallium.

Figure 4.—Stamen with pollen sacs, (a) microsporangia, (b) same enlarged, (c) microspores or pollen grains (b and c magnified).

Figure 5.—Part of seed removed. (a) cuter skin, (b) fleshy tissue, (c) nut, (reduced).

Figure 6.—Optical Section of Germinating Seed. (a) nut, (b) endosperm, (c) upper part of Cotyledon, (d) radicle, (e) aerating roots.

Dawsonia. Pl. iv.

Figure 1.—Cross-Section of Stem, surrounded by imbricate leaves, (a) hydrome, (b) leptome, (c) cortex, (d) leaf trace.

Figure 2.—Section of Leaf. (a) lamellae, (b) lamina.

Figure 3.—Leaf.

Figure 4.—Male Cluster.. (a) cluster.

Figure 5.—Male organs. (a) antheridia, (b) paraphyses.

Figure 6.—Female bud.

Figure 7.—Female organ: (a) archegonium; (b) paraphyses.

Figure 8.—Sporophyte. (a) seta; (b) capsule with calyptra, (c) sporophyte, (d) gametophyte.

Figure 9.—Cross Section of Capsule. (a) wall, (b) space with trabeculae, (c) spore sac, (d) central space with trabeculae.

Figure 10.—Calyptra (hairs removed).

Figure 11.—Capsule with calyptra removed. (a) operculum.

Figure 12.—Capsule showing (a) peristome.

ARIL OF CUPANIA AND SYNOUM.

By Miss A. A. Brewster.

An Aril, *arillus* a wrapper, is an extension of the placenta enveloping the seed, as the mace surrounding the nutmeg. Arils vary in size and shape and often get special names according to their form. The fleshy aril on a castor seed is often called a *caruncle.* The fleshy ring around the funiculus (stalk) of many seeds of Leguminosae example *Hardenbergia,* may be termed a *strophiole.* The term *aril* or *arillus* is usually more strictly applied to the layer-like covering of seeds such as *Cupania.* The aril of *Strelitzia* is in the form of a brilliant red cup-like covering of fibrous texture.

At Nielsen Park there are a number of Cupania trees. The structure of the seed and the development of the latter can be watched from the earliest stages, as many young and old fruits fall to the ground. In very young seeds the aril forms a little cup in which the tiny seed is located. As the seed matures the aril grows upwards, completely enveloping and growing beyond the seed. The upper edge of the aril is somewhat fringed and serrated. Folds occur in the upper part of the aril, the seed being thus safely tucked away as in a bag. During these stages the aril gradually changes from green to orange-yellow; later the seed grows more rapidly, turns black, and finally, when the seeds are shed, the aril is brilliant red, forming a tightly-fitting cup above which part of the black seed protrudes.

The use of the aril when the seed is mature is undoubtedly to attract the attention of birds, and so aid in dissemination. But the excessive growth of the aril just before the complete maturity of the seeds suggests that there is some other use for it, and this may be that it acts as a blanket to raise the temperature of the seed, and so aid in its maturing.

SYNOUM.—The aril of Synoum is in the form of a crescent-shaped fleshy mass in the sides of which the flat rather inconspicuous seeds are embedded. This aril is probably a fusion of two arils, it is of a bright brick-red colour, and, as in the former case, probably aids in the dissemination of the seeds, through being eaten by birds.

MURRUMBIDGEE IRRIGATION AREAS.

By Keith C. McKeown.

BAG MOTH (TEARA SP).

During the Spring and early Summer months the curious egg-clusters of this moth are frequently brought into the office by settlers for identification; there having been numerous instances in which the eggs have been deposited on the leaves of grape vines—usually upon the upper surface of the leaves.

These egg-masses are on the average about the area of a shilling piece and contain several hundred eggs, the whole mass being thickly felted over with brown scales and down from the body of the parent moth. The eggs usually hatch in a couple of days, the young hairy larvae feeding upon the epidermis and down on the surface of the leaf for about 4 or 5 days, and then die; the food apparently not being suitable for the young larvae—this has occurred in every case under observation. The reason for the parent moth depositing her eggs upon this unsuitable food plant, is probably due to the fact that owing to intense cultivation, almost all native timber has been cleared from the Area over an area of several square miles; the moths are therefore hard pressed for suitable food plants on which to deposit their eggs.

The egg-clusters closely resemble those deposited on *Acacia pendula* which give rise to the Bag Moth common on these trees.

MOUND ANT (IRIDOMYRMEX DETECTUS). DAMAGING CITRUS TREES.

During October 1919 several reports were received from settlers on the Area that Ants were doing considerable damage to Citrus trees. On investigation I found that the Ant causing the injury referred to, was the common Mound Ant (*Iridomyrmex detectus*) which was present in large numbers on individual trees, cutting the blossoms to pieces and stripping the bark off the wood of the soft young growth.

In some cases the wood was completely girdled or in other instances the damage was even more serious; the young growth being completely severed from the main stem or hanging only by a shred of bark with several ants clinging to the stem and industriously gnawing at the cut stump. The damage in most cases extended from the tips of the young growth for several inches down the stem and even on to comparatively hard and seasoned wood.

There was a marked preference shown by the insects for Shaddock trees, Orange and Lemon being next in order of preference. The trees in all cases observed were some considerable distance from any nests of the Ant.

The Mound Ant was also reported from Griffith as destroying the blossoms on Peach Trees.

This acquired habit somewhat resembles that of the leaf-cutting Ants of South America, the damage in the present instance however extending over a few weeks, the Ants then leaving the trees..

The small Black Ant (*Iridomyrmex rufoniger*) was responsible for considerable destruction of seedling carrots and parsnips; tunnelling down beside the small plant and cutting off the growth above the surface of the ground and feeding upon the severed radicle.

These attacks by Ants upon growing plants are probably due to the abnormal dry season which we are experiencing, with the consequent shortage of food.

NOTES ON THE AURORA AUSTRALIS: LEETON, 22-23rd MARCH, 1920.

By Keith C. McKeown.

On the night of Monday, 22nd, and the early hours of the morning of Tuesday, 23rd March, 1920, the Aurora lights presented a magnificent spectacle. The night was clear and cold, and quite cloudless. The display commenced about 11 p.m., as a red glow in the sky to the South, resembling the reflection from a large bush-fire; but waxing and waning at intervals; about 1 a.m. two red searchlight-like rays emerged from it, after which the light in the sky died out. At 2.45 a.m. the display commenced again more brilliantly than before, there being fully 8 to 12 brilliant rays resembling those of searchlights in which the light waxed and waned rapidly, the light waves appearing to pass from East to West, the rays alternately fading and brightening as the light waves passed along. The light-rays extended over the greater portion of the Southern sky and presented a scene of great brilliancy, the rays of light shooting almost to the zenith. The Eastern and Western sides of the display were of a soft pink colour, while the central portion was a pale green. The Western edge of each ray was sharply defined, while on the other or Eastern side the edge of the ray was softened and diffused. At times the display would die down to a white glow in the sky like the reflection of the lights of a large town or city when viewed from a distance; then the light rays would again suddenly shoot up into the sky commencing on the East and running West, the light gradually increasing in intensity

At 2.30 a.m. the display died down until only the diffused glow in the sky remained, but at 2.30 the Auroral light again increased in brilliance, and, assuming a curtain effect, the whole of the Southern sky appeared like a great curtain of quivering light, and, as though stirred with a gentle wind, the light would play as upon the folds of it as they moved; the light brightened considerably, the colours, which again were pink and green in the same order as before, increased in brilliance, becoming very vivid, especially in the Western portion of the display, the whole sky to the South presented a scene of wonderful beauty beyond description. This magnificent curtain display continued till 2.45 a.m., then dying out entirely from the sky.

While at its height, the display was sufficiently powerful to quench the light of all stars in the vicinity with the exception of those of the first magnitude, even these being considerably dimmed.

On the night of Wednesday, the 24th idem, there was another display of Aurora Australis visible between 11.30 and 12 p.m., but was only a bright white glow, as of city light, in the sky, which faded and brightened again until midnight, when it disappeared from the sky.

VOLCANIC NECK AT HORNSBY.

By Miss Heather Drummond.

At Hornsby a neck of volcanic breccia has pierced the underlying strata and outcrops at the bottom of Old Man's Valley for one and a-quarter miles. The breccia has been denuded much more quickly than the sandstone, and so makes a valley 300 ft. in depth. The breccia contains inclosures of a very interesting nature, shale, sandstone, and bitumen derived from the underlying Triassic and Permocarboniferous strata. The bitumen from the coal seams is often associated with calcite, being frequently surrounded therewith. This volcanic rock is of great interest, there being only two others of its kind near Sydney—at Prospect and Dundas. The rock is being quarried at the northern end of the outcrop for road metal. Where exposed in the quarry it shows oxidisation and spheroidal weathering.

NESTS OF THE MOUND ANT, *IRIDOMYRMEX DETECTUS.*

By Thos. Steel.

This ant, known also as the Road Ant, is common all over Australia. Its nests are familiar objects by the roadsides and in open places everywhere, being always free from vegetation and covered with a layer of small stones or pebbles mixed with fragments of twigs. It is generally supposed that the pebbles are merely what have been met with in the process of excavating the nest, and that they are deposited on the surface merely to get rid of them. For a long time past it has appeared to me that the quantity of pebbles on a nest was out of all proportion to the extent of the excavations beneath the surface, and it seemed impossible that they could all have been obtained in this way. Observation has shown me that the pebbles are collected in the vicinity of the nest and brought and deposited thereon by the ants.

I noticed a nest near a footpath at Pennant Hills, which was covered with the usual small brown pebbles of the district, derived from the weathering of the Hawkesbury shale. It chanced that the footpath was repaired with engine ashes, and in a very few days quantities of small fragments of cinders were collected and placed on the nest by the ants. Another nest at the edge of the Pennant Hills railway station and close to a macadamised roadway, no shale pebbles being near, is covered with a mixture of small granite pebbles from the station platform, and fragments of dolerite derived from the roadway.

Usually when such are available, fragments of twigs are scattered amongst the pebbles, the latter always consisting of what is available in the immediate vicinity of the nest. A nest which I examined in Kuringai Chase was covered with a mixture of small quartz pebbles from the disintegration of the sandstone and fragments of charcoal from a fireplace near by. Examples from above-mentioned nests are exhibited. I feel puzzled to account for this habit of the ants. On referring the matter to Mr. Froggatt, he suggested that possibly it was to act as a cover to keep the nest cool in summer; but this does not seem very convincing to me. Perhaps some of our members may be able to elucidate the matter.

As these ants are often a nuisance, constructing their nests on garden footpaths and similar situations I have tried many methods of getting rid of them. Poisoning or blowing up with carbon bisulphide or other substances, is very little use, as the nests are soon renovated and recolonised from other nests which are always in communication. I have frequently poisoned nests with carbon bisulphide or with potassium cyanide, but in a few days the ants from the associated nests would be busy dragging out their dead comrades and reorganising the nest. By persistent breaking up of the nest with a mattock, the ants can be caused to desert it altogether. Another simple and efficient plan is to cover the nest with a wet sack or with a layer of cut grass, leaves or garden rubbish. The ants cannot bear to work under cover, and soon leave the nest.

THE AQUARIUM: ITS HISTORY AND MANAGEMENT.

By H. E. Finckh.

It is with much pleasure that I come before you this evening to tell you of the charms of the Aquarium, which you all know is my favourite subject. I shall tell you how you can keep fish to their comfort, and show you what a great amount of pleasure the keeping of an Aquarium will afford you. Not only to yourself, but also to your friends, for a fish-tank well established and stocked has a wonderful fascination for young and old, nature-lovers and others.

The Aquarist is working hand-in-hand with nature, shows you nature as it is, not as it has been. The Aquarist cares for and cherishes life, and does not destroy to fill his press or cabinet. He shows you a piece of nature, a world of its own, which might almost be hermetically sealed, yet flourish, self-supporting, working in perfect harmony without the aid of outside influence, excepting the influence of the heat and illuminating rays of the sun.

The Aquarium is a most wonderful thing Who but the owner of an Aquarium can show you oxygen being liberated by plant-life, and show you the appearing of life? From the apparent nothing, in a small crystal bead (the egg of a fish) you can observe life appearing, and here you can observe the development of the embryo passing through all the stages of evolution (within one week or less) which has taken nature millions and millions of years to evolve and perfect.

I shall ask you to permit me to treat my subject as if you knew the Aquarium only just as a bowl containing water and fish.

Firstly I shall give you an insight into the history of Aquarium-keeping, pass on to the principles of the Aquarium and its management, and conclude by showing on the screen how I keep my fish under natural conditions and in fish-tanks.

What is an Aquarium? This we should know first. W. A. Lloyd, of London, whom we might well call the father of the Aquarium, and certainly the first to solve the great problem of keeping a fish-tank without changing the water, as a boy visited the London Zoo. He noticed a new building being finished, and asked of a passing attendant what it was to be. He got as an answer, "a fish-house; some people call it an Aquarium." He added his doubts of its ever becoming a success and the impropriety of its being introduced into a Zoological Garden.

To keep fish in a bowl, there are records of over 200 years ago; but Henry Philip Gosse is credited with being the first to use the word Aquarium in its present sense, in his book entitled "The Aquarium," in 1854.

The term Aquarium was at the time justly objected to, because it signifies a vessel in which only water may be held, and does not express, as it should do, that it also contains animals and plants. So, too, "fish-house" was felt to be inexpressive, as other animals besides fish are maintained in it. Then Vivarium was proposed and not accepted, because it meant all kinds of animals, aquatic and otherwise. The London Zoological Society, in a book published in its early days, then called its collection of animals, ranging from Zoophytes to Monkeys, a Vivarium.

Then Charles Knight suggested the word "Aquavivarium." which was so far an improvement on the other names, that it conveys the idea of animal life in water, yet it did not include plants, which are as necessary as the animals, beside what a clumsy long name, Aquavivarium.

It was then suggested to find some name to express water, plants, and animals, but as no such word exists, either in Latin or the Saxon languages, it was found best to accept the word Aquarium, and this name, selected by an Englishman, has been conventionally accepted for the past 64 years in all English-speaking countries, and used throughout the world without translation. He was Henry Philip Gosse, of London.

It must therefore be understood that the word "Aquarium" is employed as a collective term for all associations of water, plants, animals, tanks, apparatus and buildings containing such things.

(To be continued.)

The Australian Naturalist

Vol. IV. JANUARY 4, 1921. Part 13.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

THE NATURALISTS' SOCIETY OF NEW SOUTH WALES.

Honour Roll.

THE GREAT WAR, 1914-1919.

MEMBER KILLED:

G. R. HORAN.

SONS OF MEMBERS KILLED:

THOMAS STORIE DIXSON.
E. M. CARTER.
OSCAR RAINBOW.
GEOFFRY SULMAN.
CLARENCE SINCLAIR WATSON.
OPHIR WHITE.

"He died to save a world's morality;
He died the noblest death a man can die,
Fighting for God and King and liberty,
And such a death is immortality."

Dulce et decorum est pro patria mori.

MEMBERS WHO SERVED:

W. M. CARNE.
H. DUCKWORTH.
G. M. GOLDFINCH.
C. O. HAMBLIN.
R. V. MATHEWS.
G. N. NEWMAN.
R. J. NOBLE.
S. E. ROHU.
MISS FLORENCE SULMAN.
MRS. J. SULMAN.

SONS, Etc., OF MEMBERS:

H. J. Carter:

H. G. Carter.
R. B. Carter.
Sister N. M. Carter.

Sir Joseph Carruthers:

Sister Ida Carruthers.

Hugh Dixon:

Mrs. H. S. Eaton.
H. S. Eaton (*grandson*).

Archdeacon Haviland:

E. E. Haviland.
A. C. Haviland.
A. R. Haviland.

D. W. C. Shiress:

J. L. Shiress.
R. O. B. Shiress.

Thos. Steel:

W. A. Steel.
T. P. Steel.

C. J. White:

Nevill White.

ORDINARY MEETINGS.

July 6th, 1920.—The President, Miss Le Plastrier, in the chair, and 35 members present.

A letter from Professor J. T. Wilson, acknowledging the congratulations of the Society upon his appointment to the Chair of Anatomy at Cambridge University, was read.

Messrs. A. S. Le Souef and E. H. Zeck were appointed Auditors for the incoming year.

Miss Heather Drummond exhibited an example of Iceland Spar, a pure form of calcite from the Belubula Caves district, and offered some remarks on the deposit from which it was obtained. Miss Drummond also submitted a question in regard to the fixation of certain markings which had developed in the flowers of a Hort. var. of *Amaryllis belladonna* raised by the late Mr. H. H. B. Bradley. The President referred the question to Mr. Cheel, who gave a suitable reply.

Miss Hilda Butler exhibited plants of *Narcissus* with abnormally contorted leaves, also flowers of the "Coral Tree" *Erythrina* *indica,* to demonstrate the method by which birds abstract nectar without assisting in pollination.

Mr. W. W. Froggatt exhibited: (1) A *Lecanid* scale insect (*Cryptes baccatum*) so thickly infesting the twigs of the Myall (*Acacia pendula*) on Quanda Station, Gular, that the owner, Mr. George Ryder,states that well-grown trees are dying apparently from this scale infestation. (2) A series of specimens of a fine moth, *Pielus hyalinatus,* showing its variable markings, the shades of colour ranging from buff to yellow, light brown, and pink. Mr. Froggatt gave some interesting notes on the habits of the insects exhibited, and the numbers that had been noticed in many parts of New South Wales this last season.

Mr. Oliver (Noll) Edwards forwarded as an exhibit examples of two species of *Nicotiana, N. glauca* Grah "Tree Tobacco," an introduced weed from South America, and *N. suaveolens* Lehm. "Native Tobacco," indigenous in Australia. *N. glauca* is a suspected poison plant, but the evidence available is not absolutely conclusive. The properties of *N. suaveolens* were recently investigated by Dr. Petrie, whose results show that the plant contains the extremely poisonous alkaloid *nicotine,* and that it is present in sufficient quantities to poison stock. (Proc. Linn. Soc. N.S.W., xli., 151.)

The President read a paper by Mr. T. Steel, comprising some quaintly interesting notes from an old British Herbal.

In his lecture, "Popular Notes on Fungi," Mr. E. Cheel drew attention to several popular articles on fungi, which demonstrated a lack of knowledge of the formation of the fungoid growths reviewed by the authors. The characteristic features of various species of rusts, smuts, bunts, blights, rots, mildews, moulds and cankers, were explained and their functions discussed. A specimen of the Ginger-beer plant was exhibited, and the action of the yeast fungus and the bacteria, of which it is the combined product, was shown. The lecturer drew attention to the extensive and valuable collection of *Fungi* in the National Herbarium. A discussion arose on the effects of spraying potatoes for Irish Blight, in which Mr. E. S. Edwards and L. Gallard participated. Mr. Edwards moved a vote of thanks to the lecturer, which was carried by acclamation.

August 3rd, 1920.—The President, Mr. A. G. Hamilton, in the chair. Miss Brown was elected a member of the Society.

Mr. H. E. Finckh exhibited a compact case for holding slides, in the form of a book, which would be suitable for a place on the bookshelf of a library. Mr. D. G. Stead offered some observations on the aboriginals of Central Australia in the neighbourhood of Ooldea, and exhibited fruits of *Eucalyptus pyriformis* and a fossil "cast' of a univalve, together with some flint flakes taken from a fossil bed at the edge of the great plain.

The Annual Meeting was then held.

September 7th, 1920.—The President, Mr. A. G. Hamilton, in the chair, and 35 members present.

A communication was received from Mr. E. H. Ising, Hon. Sec., Field Naturalists' section of the Royal Society of South Australia, requesting wild flowers for the exhibition to be held in Adelaide on 9th October. Miss McAnene volunteered to collect local flora and efforts are being made to get specimens from distant localities.

An interesting paper, entitled "Crosslands," by Mr. D. W. C. Shiress, was read by the Hon. Secretary.

A discussion was held on Miss le Plastrier's Presidential Address, in which Messrs. Froggatt, Waterhouse, and the President took part.

Miss Hilda Butler exhibited drawings and read notes on a transverse section of *Dendrobium linguiforme.* Miss McAnene, a fine collection of 19 species of native flowers from Oatley. Mr. G. A. Waterhouse, a series of butterflies reared from eggs laid by *Tisiphone abeona* mated with *T. Rawnsleyi.* Mr. W. W. Froggatt, desert dwelling beetles of the genus *Helaeus,* from Central Australia. Mr. L. Gallard, a sample of earth containing a large variety of living organisms.

Mr. Cheel read a note on "Foliar Periodicity," which was discussed by Messrs. Gillard, Waterhouse, Hamblin, and the President.

A copy of the first issue of "The Australian Gardener's Magazine" was passed round for inspection.

8th ANNUAL MEETING.

August 3rd, 1920.—Miss C. M. Le Plastrier in the chair, and 60 members present.

In a thoughtful speech, Mr. E. S. Edwards tendered a welcome home to members who had returned from the war on behalf of the Society. Messrs. Goldfinch and Duckworth responded, and gave some brief observations of interest to naturalists noted by them in localities in which they had sojourned.

The Hon. Treasurer brought forward and explained his financial report, and moved its adoption. The motion was seconded by Mr. Edwards and carried. The Hon. Secretary gave a brief resume of the annual report, which was adopted.

The list of office-bearers—who were duly elected—will be found on the cover of this issue of the Journal.

Mr. A. A. Hamilton made an appreciative reference to the high standard of excellence maintained in our Journal, and moved that the thanks of the members be tendered to Mr. Steel for his able and painstaking editorship. The motion was seconded by Mr. L. Gallard, and carried by acclamation. The services of the Hon. Secretary, the Hon. Treasurer, and the Hon. Lanternist were also acknowledged.

The President, in a carefully considered address, voiced a protest against the ruthless destruction of wild flowers in the neighbourhood of Sydney, and entered a plea for a greater display of interest by members in the field excursions. In the scientific portion of the lecture, Miss Le Plastrier showed some interesting slides to illustrate the methods of fructification and other characters peculiar to *Marchantia* and other cryptogamic plants. In moving a vote of thanks to the President for her interesting lecture, Mr. A. A. Hamilton referred to the capable manner in which she had conducted the business of the Society in her capacity of presiding officer. The motion was seconded by Mr. D. G. Stead, and carried by acclamation.

ANNUAL REPORT OF COUNCIL FOR 1919-1920.

The work of the session has been well maintained by lectures and field excursions, and our thanks are due to the earnest band of workers—most of whom are exceptionally busy people—for donating so much of their valuable time to the advancement of the objective of the Society, viz., the cultivation of an interest in Natural History.

The following lectures were delivered during the year:—Butterflies and Their Collection, G. A. Waterhouse, B.Sc., F.E.S.; The Burrawang, Miss A. A. Brewster; Dawsonia polytrichoides, Miss A. A. Brewster; Ecology of the Saltmarshes, A. A. Hamilton; War in the Mangroves,, A. R. McCulloch; Plants Which Produce Manna, E. Cheel; The

Aquarium, Its History and Management, H. E. Finckh; The Relations of Birds and Plants, A. G. Hamilton; Popular Notes on Fungi, E. Cheel; Nature and the Naturalist (Presidential Address), Miss C. M. Le Plastrier. A number of important papers were read at the various meetings, which are fully reported in our Journal.

A considerable influx of nature students is recorded in our roll of membership, several of whom—especially the younger members—have brought interesting exhibits to our meetings and contributed useful notes to the Journal.

A number of changes have been made in the personnel of the Council during the year, owing chiefly to a change of domicile rendering attendance at the meetings impracticable. We have lost, by death, one of our oldest and most respected members, Mr. W. J. Rainbow, F.E.S., an ardent worker, whose untiring energy has largely augmented our knowledge of that branch of Zoology in which he specialised. It is satisfactory to note that the important executive position of Hon. Secretary has been accepted by Mr. E. Cheel, whose administration of this highly responsible office gave such complete satisfaction when filled by him on a former occasion.

The attendance at meetings and excursions, as stressed by Miss Le Plastrier, has not been all that could be desired, but we are hopeful that the revival of interest in Nature Study, of which signs are already apparent since the cessation of hostilities, will be steadily maintained.

A. A. Hamilton, Hon. Sec.

PRESIDENTIAL ADDRESS, AUGUST 3rd, 1920.

Nature and the Naturalist.

By Miss C. M. Le Plastrier.

It may at first sight seem that such a title is a mere vain repetition of words, for what could be more intimately connected with Nature than the naturalist, and how can there be a naturalist without nature? Yet a little consideration will show us that there is much food for thought in the title, and that the attitude of the naturalist towards nature is one of supreme importance. Granted that we accept the dictionary definition that a "naturalist is one versed in natural science or natural history," and without going any further to examine the second part, *i.e.*, "one who holds the doctrine of naturalism," we have to admit that this by no means explains the relation which ought to exist between them. As a matter of fact, nature is myriad-sided and presents many points of approach. From the dawn of civilisation to our own day, human thought and attention have been directed to the study of nature and with ever-varying motives. The veiled Isis has had that attraction which always gathers round the half-seen, the half-apprehended, and in the half-light men have seen in her what their own hearts prompted them to see; the reflex of human hopes and fears, the interpreter of human destiny, the mighty Mother in whose keeping were the keys not only of life and death but also of

"the mystery
. . . . the heavy and the weary weight
Of all this unintelligible world."

Thus nature has been the load-stone which has drawn all inquiring spirits, from those whose motive has been the pure desire for knowledge, down to the commercialism of these latter days when she is wooed to be exploited.

Now we are convinced of one thing, and that is that the latter is never the view of the true naturalist. Not for what nature can bring us in hard cash, but for what she is do we love her, do we devote ourselves to her, do we woo her. I say woo, for only after long and patient devotion does she lift one fold of the mighty veil, does she grant one glimpse of the possible solution of age-old mysteries.

The true naturalist approaches nature in the spirit of reverence, of humility, recognising how puny are human intellects, and how gigantic the field in which men desire to labour, recognising also that though he give himself wholly to the task, and be prepared to

"Spurn delights and live laborious days,"

he cannot attain any finality, and all he can do is to gather up a few facts, make a few observations, a few deductions and leave it to posterity to build with what he has collected, or leave it as inadequate, or cast it out as inaccurate.

But one may say: What has this to do with us? Is not this the province of the research student, this patient, unflagging labour, this whole-souled devotion? How can such an attitude be attributed to us, who are for the most part men and women engrossed all day long and every day in the difficult task of keeping our foothold secure in the bustling, hurrying throng of the world's wage-earners? What have we to do with whole-souled devotion to nature, with unwearied knocking at her doors that she may grant to us some solution of her many mysteries? This may be said, and perhaps with the greatest justice. But nature is, as we have said, myriad-sided, and there are a thousand ways in which we may approach her.

The artist has one method; he looks at her through the medium of his genius and transfers to canvas not only seascape or landscape, but also the emotions with which they are transfigured for him—

"the light that never was on sea or land."

The poet too has his approach and to him she furnishes metaphor and simile which give to his writings colour and life, which charge words and phrases with a power which strikes deep into the human heart,

"Striking the electric chain wherewith we are darkly bound."

Many there are also to whom have been vouchsafed the poet's mind the artist's eye, but the gift of expression has been denied They see, they feel, they appreciate, and to them Nature has a power of strength and of healing. Again there are many who through love of the wild, delight in the bush, and in the shy creatures which inhabit it. These, prompted only by the interest which springs from sympathy, note, observe and store in their memories a wealth of knowledge which, alas, too often dies with them and is lost to the world for want of written record. We may have met some of these, may have been privileged to hear the lore of some "out-back" natural naturalist, some "hatter" who by dint of living so long alone has made nature, animate and inanimate, fill the place of human companionship.

Apart from these and from many others there is the approach to nature of the true naturalist, of one who watches, who observes, who notes, who puts observation to observation and record to record and thus comes to understand—ever so little—the meaning of what to the uninitiated seems a chaos. This true naturalist looks for no reward save that which comes from the satisfaction of the spirit of inquiry. It is enough for him (or her) that he can add, even a mite to the sum of human knowledge, that he can show that even through seeming disorder and wanton waste, runs an order which is stupendous, and even apparent chance is based on eternal laws. We are naturalists, and this therefore is our work, our destiny. As field naturalists we have ample opportunity of doing really valuable work, nor is any one of our members so busy or so much of an amateur that he or she cannot share in the great task. We have among us veterans in the work—Mr. Froggatt, whose name is a household word among those engaged in agricultural and pastoral work; Mr. Cheel, who astonishes even those who know him well by the extent of his studies and the depth of his researches; Mr. A. G. Hamilton, whose labours among teachers are destined to spread a knowledge and love of nature throughout the land; Mr. Waterhouse, whose fame is not confined to our State or continent; Miss Agnes Brewster, whose knowledge and patient research in botany, entomology and zoology are as great as her willingness to help others, and to pass on freely what she has gained at the cost of work and thought; Mr. Finckh, whose modesty forbids him to reveal even a tithe of his labour; last, Mr. A. A. Hamilton, whose patience, method and thoroughness may well serve as a pattern to us all. With the aid and encouragement of these pastmasters in the art, why are we not doing more? Why does the work of the society seem to fall on a few? As I have said before, everyone may share in the work and everyone should. It is on the recorded observations of many that the devoted and learned few may base their theories, and it is by the continued observations of thousands that the same theories are either established or discredited. Each of us has then a part to play; we are "citizens of no mean country," and should glory in it.

If it were a question of each going out alone, collecting alone, working out genus and species alone—in fact, going through the whole of the drudgery unaided—there might be some excuse for shirking so uphill a task. Our excursions, however, offer unique and unparalleled opportunities. In these we have experts in every branch to show us how to collect, to name our specimens, to point out this or that peculiarity of form or position, to indicate to us the lines on which we may work. This being the case, these excursions should be well attended, should be looked upon as being great privileges—as they are. At least we should expect that fifty per cent. of our members should be present. Are they? Let us consider four held quite lately, and during my term of office. Mr. G. A. Waterhouse headed one excursion to the bush at the back of Dee Why, to give practical help and guidance in collecting and recognising some of our best known butterflies; Mr. Hamilton guided us at Homebush Bay in order to exemplify some of his magnificent work in ecology; Miss Mabel Roseby gave the benefit of her knowledge and experience in the geology of the coast from Dee Why to Collaroy; and lastly, Mr. Finckh invited the Society to see his aquaria and ponds. To myself personally this last visit was a revelation, not only of the wonderful collection, but of the patience, the devotion, the unflagging attention given to the tanks and ponds. "Here," said I to myself, "is the true naturalist." Were his grounds thronged? We who were present know that they were not; just as we know that in all the excursions cited above the attendance seemed to be in inverse ratio to their value. Can we find a reason for this? We have no longer the excuse that the war has absorbed our time and our energies, and the reason must then be sought elsewhere. If the poet is to be believed, and

"Evil is wrought by want of thought
As well as want of heart,"

it may be that this same want of thought will explain our apparent neglect of this most important branch of our Society. We must never forget that we are field naturalists, and that a mere attendance at lectures and the like is not all that our calling requires of us. Nor must we ever forget that we cannot expect men and women who are specialists in their branch of science to continue to give us the benefit of their knowledge, unless we show a proper appreciation. It is, to say the least of it, unfair to expect them to give time and attention to a dozen or so of people. If I seem too personal, I throw myself on your forgiveness, but I cannot retract my statements nor alter my opinion. My connection with this Society has convinced me of two things: (1) that it is extremely valuable, and (2) that we are not sufficiently appreciative of our great opportunities "Four things," runs the Arab proverb, "come not back to man or woman: the sped arrow, the spoken word, the past life, the neglected opportunity." Therefore it may be just as well for us to consider within ourselves from time, the meaning of our Society, the value that should accrue from it to ourselves and to others, and we should ponder if only for a moment or two the full meaning of the words "Field Naturalists."

Are we true field naturalists? If we let our excursions degenerate into mere bush rambles, contenting ourselves with an afternoon's outing, how can we be true field naturalists? If we limit our work to gathering a few wild flowers, learning a name or two perhaps, but intent on the decoration of our homes more than of our minds, noting little or nothing of the habit of the plant, of environment and modifications, we may well hesitate to apply the name to ourselves. In short, if we do not go out with a definite object, even were it to learn something of one plant, to get one new light on the life history of an insect, we are not truly field naturalists. If we do not seize every opportunity of increasing our knowledge of the wonderful workings of nature, if we are not only ready but anxious to learn from those who are willing to teach us, if we do not count every excursion missed as a real loss, then we are hardly true field naturalists.

Nor does our responsibility end here. We must not only love nature ourselves, but we must be jealous for her, eager that others should know and appreciate even as we do ourselves. We have an immense field in which to work. Close and careful observation and record are needed of our plants (many, alas fast disappearing before the "improvements" of the speculative builders), of our birds and of our insects. I never go into the bush without realising the colossal amount of work to be done among the plants (for of these I can speak with more confidence). How is it to be done? This is a pertinent question, and the answer, to be practical, should be something like this: It can only be done in plants, for example, by every member who is interested in botany, taking up a species and studying it carefully, noting its habit, its variations, and the like, then, by proceeding to collect and compare other species, until a genus is completed. This would be a good life work for each amateur botanist among us, and, believe you me, who speak from the experience of years, in no other way can we do satisfactory work. Mere desultory observation now and then of this plant, and at another time of that, can lead nowhere. Having a "craze" for now one Family and now for another, can lead nowhere. Only steady work along definite lines can accomplish anything. Determination not to be daunted by difficulties, not to be turned aside by obstacles, not to be drawn away by other attractions, this and this alone can bring us to any measure of success and make our Society live and active. Our Journal, the *Australian Naturalist,* is valuable, but it might and should be made more so. If the account of every excursion could end with a notice of some work done, no matter how little, of some observations made no matter how small, of some new comparison or contrast, what a valuable Journal it would be for present readers in all the places where it circulates;

what a stimulus to others to do likewise, what a record for future scientists!

Then, apart from our especial work in connection with observation and record in the Society, there are the wider questions in which as true naturalists we should interest ourselves and on which we should speak with no uncertain voice. Our beautiful and unique bush is rapidly disappearing before the suburban builder and the suburban landowners, who will pay fairly large sums of money in buying plants with which to fill the garden from which they have stripped every vestige of the natural flora. Have we no work to do in showing that our Epacris and Leucopogons are every whit as beautiful as the African heaths, that our shrubs can vie with those of any country, that our trees are worthy of being retained and not rooted out to make way for those of other lands?

Happily for us, and for all who love nature, the gullies of our northern heights are still free from such "improvements" and their very configuration will save them for many a year to be things of beauty and joy. Though their steepness defies the builder and his works, there are other enemies abroad: the woodcutters are always at work, not merely thinning out the timber by a plan based on knowledge and reason, but ruthlessly cutting, leaving bareness and desolation in their train. Have we no protest to utter against this wholesale destruction? Have we no voice to raise in defence of our beautiful Eucalypts, of our Angophoras, surely one of the most beautiful, as it is perhaps the most artistic of trees? Had there been some one to protect our flora in the early days we should be able to find the Christmas Bush (*Ceratopetalum gummiferum*) in all its glory, close about Sydney, as we see it elsewhere farther afield, a glorious tree and not merely dwarf, secondary growths from the stumps of trees felled that there might be wood for butter boxes and axe-handles. Not that butter-boxes and axe-handles are not necessary to the community; they are so, but why sacrifice such plants for them when others would have done? Occasionally I come across a waratah, but then I must be far afield and out of the way of the tripper and the professional flower-gatherer. These stately plants should be as common on our northern heights as at Colo Vale and Hill Top. Have we no word of protest against the wholesale destruction of flowers which is still going on around us, and which, if unchecked, will continue till Christmas Bells (*Blandifordia*), the Flannel Flower

(*Actinotus helianthi*), and Boronia, especially *B. serrulata,* will some day be as rare about Sydney as the Waratah? The destroyers make no secret of their doings, the flowers are openly exposed for sale in our streets—and we are silent. Yet we are field naturalists; we have, by virtue of that title, taken the flowers and all the creatures of the bush under our care. Certain of our birds and of our other fauna are protected; why should not the same justice be extended to our flora? If people want to admire our flowers, let them go out and see them where nature meant them to be seen, not in the baskets of flower-sellers, not lying crushed and trampled in the mud of city pavements, or stuffed in vases in heated rooms. Let them see the Flannel Flowers starring the slopes, instead of buying them crushed into bunches; let them see the Boronia making splashes of vivid pink among the grey standstone; let them admire the Waratah where it is alone worthy of admiration, on the hill slopes, tall and stately, among the pink trunks of the Angophoras and the grey or brown of Eucalypts. We should insist in season and out of season on the preservation of our wild flowers. The destruction is wholesale and rapid. Even in the five years I have spent at Lindfield I can see the results; I used to find slopes white with Flannel Flowers; then came the same slopes strewn with uprooted plants; now a rare flower here and there is all I find. I must walk miles to find *Boronia serrulata* and *Blandifordia,* though a few years ago they were both plentiful enough. I am thankful that as yet our orchids have escaped; perhaps it is because they have no market value. It is our work, our duty as field naturalists, to put an end to this as soon as we can, or at least to check it. We have a distinct duty to educate the public to appreciate and protect our wild flowers. Does anyone here remember the Manly flats and swamps a few years ago? Think what they are now; remember that, if nothing is done, we shall have to write Ichabod on the glories of Kuring-gai Chase as it has been written on those of Manly. Surely our flowers are worth the effort. The thought, the fancy of generations of poets and writers have thrown a halo round even the simplest English wild-flower. Tennyson writes of "the little speed-well's darling blue." Is it any more a "darling blue" than that of our Lobelia, of our *Dampiera?* The Cowslip and Primrose are not more golden than our Hibbertias, the Woodbine and Honeysuckle cannot compare with our Hardenbergias and Kennedyias. Why is there not more respect for our flowers, more appreciation? Many of us are teachers, and can do much to bring the children to look at our flowers in the right way. Far too common is the tendency to look on our bush with British eyes, and finding there nothing like the homeland, to decry and condemn. The fault is in the point of view, and we cannot help others to get this if we have it not ourselves. Have we?

Do we co-operate to the full extent of our power with the Gould League and its noble work for the birds? Do we protest against the pea-rifle and the catapult. There is always work for us to do; always need, alas, to champion the cause of Nature. When we find trees hacked and torn, as they are to-day, we may wonder whether we are keeping Wattle Day in the right way Even where we expect to find appreciation and co-operation, we too often find indifference. By a change in the syllabus for teachers, we see that Nature Study is now no longer a compulsory subject, as it should be, but merely optional. A short-sighted policy, as we should know, seeing that all of us are field naturalists and many of us teachers. Have we voiced a protest? Has it even occurred to us to do so?

I have put these few thoughts before you, because just as a ship has to be put into dock from time to time and overhauled, so it is necessary for us to overhaul our work and our attitude towards the big things of life. No one, I am sure, will deny that our attitude to nature is important, or that even the best of us get slack at times in our service of her.

In conclusion, I should like to draw the attention of my fellow naturalists to that little corner of the great field in which I have been interested for years. I cannot say that I have done much therein. My life is too full of other work to permit more than a mere scratching of the ground, but what little I have done has only convinced me of what a great deal remains to be accomplished. Ruskin calls the mosses "the earth's first mercy," and finds in them and allied plants many useful and beautiful lessons. It is to a section of the Moss group that I should like now to draw your attention, a section in which the workers in our State are so few that we can count them on the fingers of one hand. I allude to the Hepatics.

These beautiful and dainty plants have a charm all their own, and are interesting not only in themselves, in their varied forms, from the leaf-like *Marchantia* and *Symphyogyna* to the moss-like *Chiloscyphus*, but because they are a wonderful link in the great chain which beginning with plants which their whole life long are no more than a single cell about one-thousandth of an inch in diameter, ends with our forest giants towering hundreds of feet into the air. If I can rouse in one of my hearers a desire to do some work in this neglected field, I shall be more than rewarded. The delicacy of these plants, their wonderful and often beautiful fructifications, the perfume they exhale, the simplicity of their bodies, the devices by which they retain moisture and provide for the propagation of the species, all form delightful subjects of research. I shall let the plants now speak for themselves, and you may decide for yourselves as to their attractions. I should like to mention that the photomicrographs of my slides have been taken by my friend, Mr. H Harrington, whose valuable help in the matter I wish here to acknowledge.

Slides—

No. 1. *Marchantia polymorpha,* to show female fructifications natural size.

No. 2. *Symphyogyna interrupta;* collected at Vaucluse; showing cells of fair size, and their arrangement; also the shapeless growing-point as opposed to the wedge-shaped growing-point of ferns, etc.

No. 3. *Polyotis clavigera;* a New Zealand specimen, given to me by Mr. T. Whitelegge. One lobe of the larger leaves is converted into a "pitcher" by which moisture can be retained.

No. 4. *Lepidozia centipus;* collected on the northern side of the Harbour; showing two ranks of leaves and long root-like outgrowths.

No. 5. *Frullania diplota;* Lane Cove Heights and elsewhere; showing rounded leaves with smooth edges; also the curious pitchers. In these pitchers I have often found rotifers.

No. 6. *Cephalozia* spp.; showing formation of perianth to enclose the fructification.

No. 7. *Zoopsis argentea;* leafless, silvery, one of the most beautiful, as it is one I have found least often. This photomicrograph was taken with 1/12 inch, oil immersion. On the edges of the rounded cells of the body are seen tiny bud-like bodies. These drop off and form new plants.

No. 8. *Lejeunea mimosa;* showing two ranks of leaves, also transparent perianth enclosing nearly ripe fructification.

No. 9. *Lejeunea;* different stages of perianth and fructification.

No. 10. *Riccia asprella;* section of thallus showing spore cases in various stages of ripeness; two are about to burst; in one the wall is gone and the spores are lying loosely. These will be shed on the decay of the thallus.

No. 12. *Jamiesonella grandis;* in this moss-like Hepatic the spore capsules are borne on a stalk, and when ripe the capsule breaks along four lines, thus forming a cruciate form. In this slide the spores are seen, mixed with the sterile cells (elaters), whose function is to help in the dispersal of the spores.

No. 12. *Aneura pinguis;* a thalloid form, bearing stalked spore capsules. The slide shows the open cruciate form.

No. 13. *Marchantia polymprpha;* section of the female disk showing the developing spore-capsule.

I trust that I have not trespassed too much on your attention The subject is one of absorbing interest to me, and I have long been anxious to bring it under the notice of those who might take it up. I shall be only too glad to give all the help I can to those who wish to do a little work in this neglected field. The collecting is full of interest, as the plants grow in shady places by the road-side, in deep gullies, on tree trunks, and on rocks in moist localities.

In conclusion, I desire to thank you for the attention which you have given me, and also to place on record my appreciation of the honour you paid to me a year ago in electing me as President of our Society. I have tried to fulfil the duties to the best of my ability, for I have the welfare of the field naturalists at heart. To the best of my ability also I have striven to bring you to see and love Nature—as I am convinced all the members of this Society should, and as I have learned to do long ago. It is worth while even from a selfish point of view, seeing that—

. . . "Nature never did betray
The heart that loved her."

THE NATURALISTS' SOCIETY OF NEW SOUTH WALES.

STATEMENT OF RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDING 31st JULY, 1920.

Receipts.

				£	s.	d.
Balance from last year				89	13	2
Subscriptions	£45	17	6			
Sale of *Australian Naturalist*	1	17	6			
				47	15	0
Interest—						
War Loan	2	5	0			
Savings Bank	1	9	8			
				3	14	8
				£141	2	10

Disbursements.

				£	s.	d.
Notices of Meetings and Journal				10	0	0
Printing—						
Four Parts *Australian Naturalist*				20	12	6
Presidential Address	£1	15	0			
Invitation Cards	1	17	6			
				3	12	6
Petty Cash				4	2	0
Postages, Notices, and Journal, &c.,				12	1	6
Balance—						
War Loan	50	0	0			
Savings Bank	39	2	1			
Cash in Hand	1	12	3			
				90	14	4
				£141	2	10

Examined and found correct.

A. S. LE SOUEF
E. H. ZECK

Hon. Auditors.

H. E. FINCKH, Hon. Treasurer.

30th July, 1920.

Mr. Waterhouse would be glad to receive pupae of *Tisiphone abeona* from the neighbourhood of Sydney, for use in breeding experiments which he is carrying out.

OF VICTORIA

The Australian Naturalist

Vol. IV. APRIL 1, 1921. Part 14.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

ORDINARY MEETINGS.

October 5th, 1920.—The President, Mr. A. G. Hamilton, in the chair and 45 members present. A letter was read from the Hon. Sec. of the Field Naturalists' section of the Royal Society of South Australia, asking for contributions of wild flowers for the show to be held in Adelaide on 9th October.

Miss H. R. Drummond exhibited a specimen of kerosene shale from Lithgow showing a good example of chonchoidal fracture, also a fungus which Mr. Cheel identified as the sporophore of *Fomes australis.* Mr. L. Gallard, a large sketch showing interesting structural characters of *Nymthyredium.* Mr. E. Cheel, live cup-moths (Limacodidae) from galls on *Eucalyptus smithii,* and *E. citriodora* growing at Ashfield. Mr. T. Steel specimens, with note, of the native black-thorn (*Bursaria*), heavily infested with the common citrus wax scale.

Archdeacon Haviland sent specimens of *Kolchia villosa* var. *tenuifolia.*

Mr. A. G. Hamilton exhibited a Churinga or sacred symbol, some stone axeheads (one made of sandstone), a chisel-like stone implement, some West Australian spearheads of glass, delf, and chalcedony, and for comparison, some North American Indian arrow-heads of similar materials.

A highly interesting lecture—"The Ooldea Wonderland, Central Australia"—was delivered by Mr. D. G. Stead.

November 2nd, 1920.—The President, Mr. A. G. Hamilton, presiding, and 24 members present. A letter was read from Mr. E. H. Ising, conveying thanks for the assistance rendered to the Wild Flower Show at Adelaide by Miss McAnene in forwarding exhibits. Mr. H. E. Finckh exhibited live examples of the climbing perch (*Anabas scandens*), with notes thereon. Mr. L. Gallard, beetles, larvae of Silphidae (Burying Beetles), and of Tisiphone abeona, also butterflies. Miss McAnene, larvae of *Danina Banksia.* Mr. A. A. Hamilton (1) specimens of the "Lime" or "Linden-tree" *Tillia Europaea* L.; *Hypochaeris radicata* L., the "Perennial Cat's-ear" or "False Dandelion"; *Tarraxacum Dens-leonis* Desf., to illustrate factors in seed dispersal; (2) photos of the Sand-dune and Saltmarsh plants of Port Phillip, taken by Dr. C. S. Sutton; (3) a specimen of the "Navelwort" *Cotyledon umbillicus* a relative of the "Stonecrop," taken from the wall of an old church in England forwarded by Mr. F. W. Carpenter, a former President of the Society. Miss Butler, flowers of *Wistaria multijuga.*

Mr. Cheel also exhibited a series of specimens as under:—

Boronia ledifolia. Typical form.
Boronia ledifolia var. *trifoliata.* White flowered form.
Boronia ledifolia var. *trifoliata flore pleno.* Double flowered form.
Boronia ledifolia var. *rosmarmifolia.* White flowered form.
Boronia ledifolia var. *flore pleno.* Double flowered form.
Boronia pinnata, flore pleno. Double flowered form.
Eriostemon lanceolatus, var. *alba.* White flowered form.
Erostemon Crowei, var. *Alba.* White flowered form.
Kennedya rubicunda, var. *Alba.* Flowers of a pallid or greenish-white colour.

Mr. A. G. Hamilton, part of the National Geographic Magazine containing fine photographs and coloured drawings of American fungi.

December 7th, 1920.—The President, Mr. A. G. Hamilton, in the chair, and 37 members present. The following were duly elected to membership:—Misses B. Champion and E. Spencer, Messrs. Wolfcarius and Hindmarsh.

Mr. C. Hedley, F.L.S., Acting Curator, Australian Museum, gave a very fine illustrated lecture—"Natural History of the Hawaiian Islands." The extreme isolation of the group of Hawaiian Islands from the mainland of America, together with the relationship of the fauna and flora, was dealt with in a clear and interesting manner, and many points of interest touched upon in connection with the plants which show a relationship with such genera as *Metrosideros*, also of the family Lobeliaceae and others occurring on Lord Howe, Fiji, New Caledonia, &c. A very hearty vote of thanks to Mr. Hedley was carried by acclamation.

Mr. Waterhouse had a fine series of butterflies on exhibition.

THE AQUARIUM: ITS HISTORY AND MANAGEMENT.

By H. E. Finckh.

(*Continued from p.* 176.)

And the conditions under which an Aquarium must be conducted are:

The water used, whether salt or fresh, must not be changed, and it must not be added to, except to supply deficiency caused by evaporation or accidental loss.

The animals must be any or all which by means of gills or by having a respiratory function distributed over the surface of their body, possess the power of extracting oxygen dissolved in the water.

I might mention here that only the illuminating rays of the sun cause the plants to give off oxygen, not the heat or other rays.

Dr. Priestly, another Englishman, discovered oxygen, the invisible gas which supports animal life and keeps everything in nature pure.

Priestly did more; he ascertained that it is the plant-life, both land and water, which, under the influence of light, emitted this gas, and he was the first to lay down the law upon which the existence of an Aquarium depends. Dr. Priestly was the one to lay down the law, but W. A. Lloyd was the first to maintain an aquarium by combining plant and animal life; yet for some years before, a barber in London was unknowingly keeping an aquarium, in the most scientific manner imaginable, and this led up to the discovery by Mr. W. A. Lloyd.

One day W. A. Lloyd dropped into a barber's shop, and noticing a fishbowl on the windowsill in which the water was perfectly clear, of course put the question, "How often do you change the water?" The answer was, "Never now. I have had these two fish for about two years. I used to change the water whenever it became dull, and the fish came to the surface gulping for air, perhaps once or twice a week in summer, less frequently in winter. But since I have put this piece of coral, as a decoration, into the bowl (a piece of Brain coral the size of a fist) I have found the water to remain clear for a longer period, and eventually it remained always clear, so that I have not changed the water for many months." He added the only trouble was that the coral became discoloured, and of a dirty brown colour; when it got too bad he took it out and scrubbed it, but it always went back again, because it kept the water clear.

Lloyd examined this piece of coral and found the discoloration caused by a minute confervoid growth, which has since been found to be an excellent oxygen-producing medium. In fact, the lower forms of aquatic vegetation give off a far greater quantity of oxygen than the higher forms do. Therefore the coral did it after all; but why, he did not know.

So this barber, without any knowledge of science, actually kept the first self-supporting aquarium.

The supply of a sufficient quantity of oxygen is the secret of success in keeping fish in a globe or tank. So we shall dwell a little on this subject.

All living creatures require oxygen to purify the blood. We ourselves, and life existing out of water, obtain it direct from the air by breathing and passing it through the lungs.

A fish is continually taking in water by the mouth and passing it out through the gill-covers. This action is the breathing of a fish. The blood in its circulation through the body passes through the gills, the purification of the blood is effected here, where it becomes exposed to the oxygen dissolved in the water. The walls of the tubes forming the gills, while they hinder the water from mixing with the blood, are yet so delicate that the oxygen comes into contact with the blood, penetrating the thin membranous coat, thus oxygenating the blood.

For the requirements of land-dwellers there is any amount of oxygen, and so there is for fish in a stream or pond; but not so in the small vessel in which we keep our fish. Water absorbs oxygen direct from the air, but only to a very small extent; a sufficient amount of oxygen might be obtained in this manner were we to keep our fish in a shallow vessel with a large surface exposed to the air. Where the water is deeper, as in a fish-bowl, and a comparatively small surface exposed, we must find other means of introducing it. This can be done by constantly agitating the water or by frequent changes. But the best means are to permit nature to do the work by the introduction of suitable plant life. Submerged plants must, of course, be selected. Roughly speaking, the plants absorb the carbonic acid gases from the water, converting these into oxygen.

Thereby we are creating what is termed a balance between plant and animal life, a continual exchange taking place. Personally I do not hold with the use of the term "balance," which is so frequently mentioned in this respect. A tank thickly grown with plants produce oxygen far in excess to what would be required, far beyond what would be a balance, and under these conditions our fish do all the better.

The wasting of the body is made good by the taking of food, which also induces growth. Food is taken as a fuel to keep the temperature of the blood up, but a fish, being cold-blooded, requires very little food indeed.

What is a cold-blooded animal? A cold-blooded animal is one that assumes the temperature of the water or air in which it lives. Thus the body temperature of a fish in an aquarium is always the same as that of the water: Normally healthy, warm-blooded animals have a stable temperature that does not vary with external conditions.

Great care must be taken if changing of the water is required, as the water supplied is rarely of the same temperature as that taken away, and if colder, the fish are apt to take a chill; if warmer has a disturbing effect on the slimy matter which covers the whole body of a healthy fish. Again, in removing and handling a fish, it is apt to receive injury, such as an injury to or the total loss of a scale.

Now all waters contain parasitic organisms, either animal or vegetable, awaiting an opportunity to attack fish-life, from which they then draw their nourishment at the expense of the fish If the fish are in a healthy condition they are not likely to be attacked; if the fish has an injury or the body-coating not performing its function, these parasites immediately settle on the weak spot and increase at an alarming rate, and ten to one it is a case with your fish. Successful treatment in such cases is possible if taken in hand at once; it is always troublesome, and only worth while with valuable specimens. Thus should there be any need to change the water, always see that it is of the same temperature. Prevention is easier than cure.

The greatest of care must be observed with newly-acquired fish, which under no circumstances should be placed with others. These should always be quarantined for a week or two, to avoid risk of introducing disease. All fish which I have received from the various parts of America are remarkably free, but every one from the East requires very careful watching. Our own native fish also require careful handling, as they are very apt to become covered with a parasitic fungus (*Saprolegnia*), due, I should say, to the change of the temperature of the waters when transporting. Fungus is the effect of illness, not the cause.

As fish-tanks, accumulator jars were much used when they were easier to procure, but their faults were many; being of blown glass they are always apt to flaw, the crack formed extends, and when it once reaches the top, it's all up. The glass itself is uneven, but the main disadvantage is that they are by far too deep. A tank for fish should never be deeper than the width of its narrowest side. We should always seek nature's guidance.

The round fish bowls are in every way opposed to the correct principles of Aquarium keeping. They are far better thrown away than used, even as an emergency. The surface of the water is extremely small in proportion to its bulk. The convex shape acts as a lens, and distorts the fish, but this is nothing compared to the misery to which you are subjecting your fish; the convex shape also acts as a lens towards the inside of the bowl, and focuses the light into the very eyes of your fish. Throughout the most miserable existence we could give our beautiful little pets which under natural conditions only receive top light.

ALWAYS remember a fish has a nerve system; it has a feeling as well as you and I. If we are going to deprive them of their liberty, let us give them all the comfort we can, and not make their existence one of cruel discomfort.

Anyone handy with tools can make his own tanks. A useful size is 15 inches by 9 inches with a depth of 9 inches. An inch or so of sand and grit as a foundation to root the plants in gives a smaller depth than the width. Paint, clean, and soak well. Fill the bottom of your tank to the depth of an inch and a half, with sand and shell-grit which have been thoroughly washed; into this plant your plants, fill with water, but so as not to uproot the plants; let stand for a few days, and then the fish can be introduced.

I have used pure sand, but found that it packs so densely that the slender roots of the plants cannot penetrate, and therefore do not flourish. Never make use of garden soil unless you want endless trouble.

Plants used should be those of submerged habits; floating plants and the kinds which grow above the water produce very little oxygen, if any, below the surface of the water. The most easily obtainable are *Vallisneria, Elodea* and *Ceratophyllum,* and these can be collected locally.

Hitherto the obtaining of water plants has been a difficult matter, but the above plants, as well as other suitable varieties, can now be purchased from Milligan, Limited, nurserymen, Mascot.

After much experimenting I find that in our part of the globe, where the daylight is so strong, the best position for a fish-tank is near a window, where it does not receive direct sunlight. The disadvantage of an excess of light is, it causes the glass to become covered with confervoid growth which obstructs the view through the glass. This is its only drawback, for the growth of this minute algae is most beneficial as food as well as for the supply of oxygen. Stronger light still causes, besides this, such an excess of minute microscopic plant life throughout the water that it becomes quite green. Such waters usually teem with microscopic animal life, and such conditions are ideal for the rearing of young fish.

Now that our tank is ready to receive fish we shall consider what fish to stock with. These we can divide into those of our own country and the imported. The latter we can split up into those which will endure our winter temperature and those which will require artificial heating during the winter months, and these again we can separate into oviparous and viviparous.

For the beginner the Goldfish is not a good kind to start with, but being such a bright and showy fish the temptation cannot as a rule be resisted, so if you will have him, do not put more than two small ones into a tank of this size. If these are doing well, say after three months, another two can be added, but never more. Be certain that the new fish are healthy; quarantine them, especially if they come from a dealer, otherwise you may lose both the new with the old, which is always sad after having succeeded in breaking them into tank life.

A very good fish to begin with is the Paradise-fish (*Macropodus viridi, auratus*), which comes from Japan, and can be bought cheaply from the dealers. Endeavour to get a true pair. It's a beautiful fish with good colourings, becomes very tame, will breed in a tank. When one or two tanks have been mastered, take some of our Australians in hand. A better one still is the *Gambusia affinis*, of the viviparous Tooth carp family. Not quite so easily obtained, yet obtainable. Young of the viviparous fish are much easier to breed and to rear than those of the egg-laying varieties. During one season up to one hundred of these would be an easy matter to rear, and being a small fish, an ordinary tank would accommodate twice this number.

There is our beautiful little Blue-eye (*Pseudomugil signifer*); you could not wish for anything prettier than twelve or eighteen of these little fish in a nicely-arranged tank. Another is the Galaxias. If we go a little further north we get the Chanda Perch (*Ambassis agassizi*) and the Atherines. Neither of these four kinds have been bred in Aquaria, so there is your chance to enlighten us on their breeding habits.

Coming back to Sydney, we further have *Carassiops compressus* and *Carrassiops galii*, both beautiful Aquarium fish, but these cannot be classed as ideal Aquarium fish. An ideal fish for the Aquarium should be a free-swimming fish which is always on the move. Both the *Carassiops* are sluggish, remaining for hours in the one position; they certainly become lively when approached to feed.

Further north again the beautiful *Krefftius adspersus* is met with, also a slow fish, but the fine colouring makes up for these shortcomings. This finishes our own fish fauna suitable for the Aquarium.

After successful working you may become like I am, "all fish," and then you can go in for the cream of Aquarium fish, the more delicate viviparous Tooth carp. Some of these are gorgeous in colouring, well shaped and finned, their habits and breeding charming; breed easily, and are easily cared for—the hardiest fish I know of. The only conditions are that the water must not go below 65 degrees Fahrenheit. Of the six kinds of the viviparous Tooth carp, which I have been successful in landing, only one will stand our winter temperature. *Gambusia affinis.*

Incidentally, I might mention here that during the last three years I have been fortunate enough to land eleven species of fish new to Australia, both from America and Singapore, of which I have only lost three species, and these had arrived in poor condition, and I have succeeded in breeding eight species.

The Feeding.

I should almost say that the reasons of non-success—if your tank is well established—are mostly due to improper feeding, improper food, and rather overfeeding than underfeeding; by overfeeding I wish to express more than the fish will eat.

Live foods are by far the best, such as earth-worms, waterfleas (*Daphnia*), and mosquito larvae. The ideal live food are the Enchytrae-worms, which are bred and sold for the purpose in the U.S.A. It's a small, threadlike white worm, and will live for several days in the water. After many failures to get this worm through by parcels post, I succeeded by having them carried by hand, kept open and moistened *en route*. These worms are easily cultivated in boxes filled with rich garden soil, which is kept moist with milk, and they are fed with sour milk and mashed potatoes.

Of artificial foods only specially prepared should be given, the Japanese fish biscuit is readily taken by some fish, but is not a good all-round food. A good food which is taken by all fish is ground shrimp. The shrimp are imported into the U.S A. from Mexico in a dried state, and then ground. Unfortunately the demand here is so small that it is not imported commercially. I get my supplies direct from the States.

Finely-shredded beef is a food readily taken by all fish, and can be used with great advantage as a change of diet. Bread, biscuit, and such stuff must be avoided absolutely.

You cannot succeed in rearing fish broods in tanks unless you supply them with live food, and certainly the appearing of young fish in your tank and the rearing of a brood is great excitement, and the noting of observations interesting as well as of scientific value.

Hitherto the Daphnia have been bred in large tubs as food. I have found it a very slow and troublesome process, and could never make a great success of it. Fortunately and eccidentally, I have solved the great problem to produce a live food, small enough for the youngest fish; easily, quickly bred, and in great quantities. My scheme has been published in an American Aquarium periodical, and on account of its simplicity and success has been adopted to a great extent. I am also told that it has proved a great boon to fish breeders, and I have made use of our doubtful friend the Mosquito. As I have said before failures are mostly due to overfeeding. All foods but live foods which are not eaten by the fish must be removed, as they decay quickly, besides developing the Saprolegnia Fungus.

Aquatic snails are of great benefit to an Aquarium; they help to clear the confervoid growth from the glass, but certainly not to the extent they are credited with. Where we gain by placing them in our tanks is that they consume much of the food which is not eaten by the fish.

Tadpoles are excellent scavengers. If a tank has become too much overgrown with confervoids, a handful of tadpoles will clean it up in a very short space of time.

How often shall I feed my fish? is the question asked. Books tell you two or three times a week. I feed my fish every day, sometimes two and three times. A fish is much like a man, you reach his heart through his stomach. I make chums of my fish. Whenever they ask for food they get it. When I enter my den in the morning there are quite a thousand fish asking for food, and they get it.

List of Fishes.

Australia—

- Pseudomugil signifer.
- Carassiops compressus.
- Carassiops galii.
- Krefftius adspersus.
- Melanotaenia nigrans.
- Ambassis agassizi.
- Galaxias.

Asia—

- Macropodus viridi auratus.
- Oryzias latipes.
- Betta pugnax.
- Ctenops vittatus.
- A cyprinoid.
- Misgurnus anguillicaudatus.
- Anabas scandens.

America—

- Xiphophorus helleri, Mexico.
- Lebistes reticulatus, Barbados.
- Gambusia affinis, Southern U.S.A.
- Gambusia holbrooki, Southern U.S.A.
- Lepomis pallidus, U.S.A.
- Jordanella floridae, Florida.
- Limia caudofasciata, Barbados.

Eight of the exotic are new to Australia.

NOTE BY EDITOR.—Mr. Finckh's lecture was illustrated with a large series of beautiful lantern slides from photos taken by himself in his Aquarium. Further information can be gleaned from the report on the excursion to Mr. Finckh's grounds, *Aust. Nat.* Vol. iv., p. 152.

THE FOOD OF RATS.

By Thos. Steel, F.L.S.

In an article entitled "The Invasion of Trenches by Rats," *Nature*, 102, 53, quotes from the *Revue Generale des Sciences* a paper by Prof. P. Chavigny on above subject. It is stated that the rat which invades trenches is nearly always the ordinary brown or Norway rat (Mus *decamanus*), but in the case of dry trenches the black rat (*M. rattus*) may be present. Prof. Chavigny says that rats live on exactly the same food as man, and cooked in the same way. Of raw food they can make scarcely any use. For instance, they simply starve on raw barley. They will gnaw and destroy almost anything that their teeth can penetrate, but what they actually live upon is simply the ordinary human food which they are able to reach, and particularly the remnants from meals. The disappointing results obtained by the various methods of destroying rats are due to neglect of the fact that multiplication of rats is simply the result of scattering human food within their reach.

Some of the above statements appear to me to be extraordinary, particularly the alleged necessity for rats to get cooked human food. The hordes of rats which swarm along our foreshores and in granaries, abattoirs and such-like haunts, could not possibly get sufficient cooked human food to keep them alive, yet they are plump and well-fed. Anyone who has kept ducks or hens in a rat-infested place, knows that rats will attack the young birds, even dragging them from under the brooding mother, and devouring them raw, while attacks on living and dead human beings are by no means rare. Along the waterfront rats freely catch and eat crabs, and they will devour raw fish with avidity. Certainly they will eat cooked human food when they can get it, but they are omniverous feeders, and I have personally known them to devour, not merely gnaw, raw pumpkin, melon, apple, and other fruit. Of pumpkin seeds they are very fond, and an apple core makes a good bait for a trap They do not seem to care much for raw mutton or beef, but they will devour that too. My wife once noticed them attack raw potatoes and pumpkin seeds, and neglect a piece of raw beef which was alongside. They are partial to young birds, and will climb trees and harry nests. Under a creeper in my garden at Petersham, near Sydney, the common snail (*Helix* *aspera)* was very abundant, and *M. decamanus,* to which all my observations refer, used to devour quantities of them; the apex of the shell was always bitten off so that the mollusc could be readily extracted. On the upper Waikato River, New Zealand, the same rat dives into the water and gathers the fresh water *Unio,* which it gnaws open and eats. The shells are always gnawed through at the same spot of one valve, but I forget now whether it is the right or left one.

The well-known "Bugong" or "Bogong" moth at times invades our cities and comes into houses, stores, &c., for darkness and shelter. At Melbourne I have observed the rats in a large sugar store collect the moths and eat the bodies, rejecting the wings. I recently observed a case of a somewhat curious article of diet for a rat. For a number of months a rat which frequented the laundry attached to my house, made a practice of eating soap. Pieces of ordinary bar soap used for washing clothes, left lying about, were taken to sheltered corners and there consumed. A specimen exhibited shows the marks of the rat's teeth. After many attempts, I succeeded in trapping the rat, which proved to be a young male of the common brown rat (*M. decamanus*). The excreta left by the animal was always quite normal, so I conclude that it must have got other food besides the soap, but I have been quite unable to trace its mode of ingress and egress from the laundry, as I could not find holes or openings of any kind, and no food was ever kept there.

It may be of interest to describe the trap by which, after many attempts with other devices, I was able to catch the rat. A spring trap was set open in a box with a piece of tissue paper over the jaws, and the whole completely covered, paper and all, with bran, and a piece of fresh fish placed at the far end of the box. The lid had an opening cut just above the jaws of the trap, so that when the rat entered the trap was sprung and the visitor captured. On examination I found its stomach gorged with fresh bran, which it had scooped up before entering, but the intestines were practically empty.

SOME NOTES ON *KOCHIA VILLOSA*, LIND: VAR. *TENUIFOLIA*, F.v.M.

By Archdeacon F. E. Haviland.

The paddock of my Rectory at Coonamble was covered with a growth of *Kochia villosa*, Lind, var. *tenuifolia*, F.v.M., and thus I was in a fair position to make some close and regular observations of certain features of foliage and pollination, the following having been noted:—

Foliage.—The development of the foliage is both peculiar and interesting, apparently comprising three stages—First: On the apices of the branches the new leaves grow to a length of half-an-inch, in section are a plano-convex, and in form linear lanceolate; they are somewhat villous, but not so much so as the type. Secondly: As the branches lengthen out the older leaves quickly become contracted to one-quarter of an inch or even less in length, are quite terete and ovate, and sometimes even globular, glabrous and very succulent; at this stage, in section, they are partially hollow by reason of the severe contraction, and the spongy tissues very loose. Thirdly: The leaves soon pass into a withered condition, and then shrivel up, remaining persistent as charred remains on the otherwise bare branches.

Pollination.—The flowers are axillary, develop very slowly, have a perianth of five lobes almost bullate, and with ciliate membranous margins closing firmly over the ovary. At a very early stage the two styles with dark brown stigmas appear erect, and soon become covered with pollen, though the stamens are as yet very short and far concealed under the ovary, and the anthers young. It is not till the fruit is half grown that the horizontal dorsal wing around the perianth begins to develop, and when it is fully grown it is almost entire, having only one interruption, and resembles a frilled collar with one end slightly overlapping the other. Having examined some twenty flowers, I found that at this stage the stigmas wither down, and the lobes of the perianth lift slightly, allowing the stamens with their ligulate filaments and cordate anthers to become exserted. The wing now grows to its normal width of about three lines as though to afford a stage for insects to settle upon so that they may become a vehicle for the now ripened pollen. From such circumstances I conclude that this plant is cross fertilised, and this suggestion is endorsed by Bentham's remark that the plants of this genus are sometimes polygamous.

I have noticed only the ordinary house-fly (*Musca domestica*), particularly young ones, and a few ants crawling over these plants, and thus infer that they may be the pollinating agents.

EXCURSION TO BOTANIC GARDENS.

The monthly excursion (July) took the form of a visit to the Herbarium and Botanic Gardens. The visitors were conducted through the Herbarium, and its activities explained by members of the staff. After the inspection the party was invited to afternoon tea by the Director and Mrs. Maiden. The President voiced the thanks of those present to our hosts, and the Misses Maiden for their thoughtful provision for our entertainment. The members expressed their appreciation by acclamation.

A.A.H.

ERYTHRINA INDICA.

By Hilda Butler.

The brilliant scarlet flowers and abundant nectar of the coral tree (*Erythrina indica*), attract many birds that constantly flit from flower to flower; yet, in the neighbourhood of Sydney, the tree does not set fruit. If the bird, in seeking nectar, were to push the large uppermost petal, the vexillum, upwards, and insert its bill into the tube formed of the fused filaments of stamens, and in which the nectar lies, it would be almost certain to brush some of the pollen from the stamens on to its breast, and that pollen would be deposited upon the stigma of the next flower visited.

The silver-eye, however, takes a short cut to the nectar, and neglects its task of effecting pollination. The bird perches at the base of a bunch of flowers, turns its head on one side, and, piercing the keel of the flower with its bill, extracts the nectar which the plant prepared as a reward for pollination.

DENDROBIUM LINGUIFORME.

By Hilda Butler.

Dendrobium linguiforme is generally found growing upon rocks in exposed positions, where it is subjected to strong sunlight and drying winds, and where there is a meagre water supply. The plant is a xerophyte, and its adaptation to its environment is well seen in the peculiar modification of its leaf.

The leaves vary in length from ½ to 1 inch, are elliptical in shape and very thick, the surface is always rough to the touch, and in dry weather longitudinal furrows appear owing to the contraction caused by loss of water from the tissues. Most of the leaves, and particularly those exposed to the direct rays of the sun, assume a purplish red tint.

A transverse section of a leaf shows that in structure it resembles a typical monocotyledonous stem, its bulk consisting of a pith-like mass in which vascular bundles are embedded. The outermost layer is one of thick-walled epidermal cells, the outer walls of which are very strongly cutinised, and over almost every cell the cutinised layer forms a short, thick, blunt process somewhat resembling a small hair in shape. The stomata are not numerous, and are sunk below the general level of the surface. Next is a layer of thick-walled rectangular cells somewhat radially elongated and corresponding to the palisade tissue of an ordinary leaf, but in this case very little chlorophyll is present, and often the cells contain a purplish-red pigment which protects the chlorophyll-bearing cells below from excessive light. Below this is a large zone of parenchymatous tissue in which numerous vascular bundles are embedded.

Intercellular spaces, in which water is stored, are very large, especially towards the centre of the leaf. The outermost layers of these cells constitute the chief photosynthetic tissue of the plant, and the innermost cells, in which starch is abundant, function as storage tissue.

NOTES AND COMMENTS.

Kerosene Shale.—At the October meeting, Miss H. R. Drummond exhibited a specimen from Lithgow, showing remarkably good chonchoidal fracture. Kerosene shale occurs on the edges of the coal basin, and is believed to be formed of the spores and oil-bearing parts of the vegetation which have accumulated through drifting to the edge of the ancient marsh. When a fragment is held in a flame it gives off the odour of kerosene.

Fomes australis.—A fine large specimen of this fungus was exhibited at the October meeting by Miss Drummond. The specimen was the result of about 18 months' growth on a dead gum-tree. It first appeared as a small yellowish growth, which every few months became covered with spores on the ventral surface. After each shedding of spores, a layer of new growth was added round the outside edge. The specimen was kept under observation at Kurraba Point during its entire development.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

ORDINARY MEETINGS.

February 1st, 1921.—Mr. W. W. Froggatt in the chair. Miss Steinbech exhibited a collection of shells and botanical specimens from South Australia; Mr. L. Gallard a series of larvae; Mr. Waterhouse commented on the scarcity of cicidae during the past season and invited members to relate their experience. A note by Mr. W. A. Oakey, giving interesting observations on a spider (*Calaenia excavata*) in his garden, was read. The business of the evening was a lecture by Mr. G. M. Goldfinch, entitled "An Entomological Trip to Western Australia." Mr. Goldfinch gave an account of the vegetation seen when travelling along the Transcontinental Railway, making special reference to the "Kangaroo Paw," "Tuart" and *Leschenaultia.* A very fine series of moths was exhibited and greatly admired by the members.

March 1st, 1921.—Mr. W. W. Froggatt presided over the meeting and 35 members were present. A hearty welcome was extended to Mr. and Mrs. Parry, who had just returned from Europe after an absence of nearly six years, also to Mr. Pemberton, a visitor from the Sugar Planters' Association, Honolulu.

It being a members' evening, the following notes and exhibits were contributed:—Mr. Froggatt a series of the Green Spiny Phasmid (*Extatosoma tiaratum*). Miss Winter the Rock Gecko (*Gymnodactylus phyllarus*) with its original Spring tail and the second tail grown after the first was dropped, this was smaller and without spines. She gave an interesting account of several she had kept in captivity and fed on wood lice. Mr. L. Gallard read notes on a series of young Green Spiny Phasmids (*E. tiaratum*) collected near Epping, also two fine undetermined species of another genus, also an adult of the curious neuropterous insect *Ithone fusca,* the larvae of which he had exhibited at a previous meeting and *Psy-*

chopsis insoleus and its larva, bred in captivity. Mr. E. Cheel a series of fresh specimens of plants important to commerce, cultivated in his garden at Ashfield. These comprised:—*Eucalyptus citriodora* (Lemon-scented gum), *Leptospermum citratum* (Lemon-scented tea-tree), *Cymbopogon Martini* and *C. nardus,* two lemon-scented grasses, *E. smithii,* E. Macarthuri, *E. radiata* and *E. numerosa* four useful eucalypts yielding the valuable eucalyptol and phellandrine oils, *Backhousia citriodora* (Lemon-scented Backhousia), *Mentha piperata* (Peppermint), *M. citrata* (Bergamot mint), *M. viridis* (Spearmint). Mr. Cheel showed *Datura fastuosa* var. *cornucopae* raised from seed collected in Fiji in 1918, together with foliage of six distinct kinds of "Castor-oil plants", (*Ricinus communis*). Master Drummond a fungus identified by Mr. Cheel as probably *Trametes gibbosa.* This very closely resembles *Polystictus hirsutus* and requires further investigation. A fine series of puffballs were brought by Mr. L. Gallard and determined by Mr. Cheel as *Calvatia lilacina.* Miss H. Drummond exhibited specimens with notes, of Iron pyrites. Mr. Finckh contributed notes on aquatic plants and fishes in captivity. Mr. Froggatt spoke of the absence of the large coastal cicadae during the 1920-1 season and their erratic appearance late in the season in some localities. An interesting discussion followed, in which Messrs. Gallard, Watson and Stead took part.

April 5th, 1921.—The President, Mr. A. G. Hamilton, in the chair. Misses R. B. Carruthers and A. Kent were elected members.

Mr. L. Gallard exhibited, with notes on life history, a wasp (*Goniozus antipodum*) and a lace-wing (*Porismus strigatus*). Mrs. Burrell fresh flowering specimens of a white flowered form of "Bottle Brush" (*Callistemon lanceolatus*). The two original plants were found several yards apart in the bush behind the Coast Hospital and were sucessfully lifted and transferred to her garden at Kensington. From one of these plants a cutting was rooted and the flowers exhibited were taken from the latter.

Mr. Cheel showed fresh flowering specimens of *C. lanceolatus* var. *lilacinus,* from a cultivated plant in Ashfield, raised from seed received originally from Berlin in 1913. From the same batch of seedlings a white flowered form had been raised and is cultivated in the Botanic Gardens, Sydney. Mr. D. G. Stead made reference to the biological evidence as to the recent upheaval of the shore line around Port Jackson. Recent observations showed an elevation of not less than 9 feet above present spring tide levels.

Mr. P. D. Murray gave a lantern lecture entitled "Notes on Papua," which was much enjoyed and appreciated by the audience.

May 3rd, 1921.—Mr. Froggatt presiding and 56 members present.

Miss Drummond exhibited fulgurites and read a descriptive note thereon and Mr. W. S. Dun offered interesting remarks descriptive of the occurrence of these structures in the sand hills at Kensington and Cronulla. Mr. E. L. Hayes a stone axe found at Blackheath near Evan's Lookout. Shaped from a water-worn basalt pebble, which must have been brought from a long way off. Mr. Hayes also showed a beautifully marked piece of chert from below Grand Canon, Blackheath. Chert is stated by Professor David to be perhaps the most characteristic non-carbonaceous rock of the Permo-carboniferous series. It may produced from diatoms, radiolaria, or sponge spicules, also from volcanic ash or tuff—Nobby's Head, at Newcastle, over 80ft. high, is formed of regularly stratified cherts.

Miss McAnene brought the larva of *Danais menippe,* which was commented upon by the Chairman. Miss Steinbeck polished limpet shells from New Caledonia and the nest of the Mistletoe Bird. Mr. White supplied some interesting details of the longevity of *Carrasiops compressus* in captivity.

Mr. A. R. McCulloch gave an extremely interesting lecture on Lord Howe Island, in which he described the devastation wrought by the accidentally introduced plague of rats and its effects on the Palm-seed industry, and offered some useful suggestions as to their destruction. Incidentally the rats are menacing the existence of certain rare indigenous birds by eating their eggs. The lecturer expressed the opinion that the Woodhen would soon be extinct. The geological aspect of the island was illustrated by a series of fine lantern views and the most prominent species of the flora and fauna depicted in a similar manner.

The lecturer closed a most instructive address by remarking that the island provided some of the finest scenery he had ever seen. A vote of thanks was unanimously tendered to Mr. McCulloch.

A FLORAL SURVEY OF THE SOUTH WESTERN SLOPES OF N.S. WALES ROUND ABOUT TEMORA AND BARMEDMAN.

By Right Rev. J. W. Dwyer, D.D., Bishop of Wagga.

The following list of plants gathered in my wanderings of five years round Temora and Barmedman is fairly exhaustive as far as Flowering plants—both di- and mono-cotyledons are concerned, but not much farther, and may serve as a foundation on which the floral surveyors of this or any other sections of N.S.W. may build their edifice.

The *AREA* covered extends along the railway from Stockinbingal to Wyalong and includes an average strip of 10 or 15 miles on each side of the line, and the area is typical of almost all the country that links the tablelands of the South West with the Western plains.

I have tried to indicate, though I fear very imperfectly, the class of *geological habitat* in which the plants have originally flourished, and a word about the soils may be beneficial. Included in the area are several distinct *SOIL* formations. The general formation from Stockinbingal to Barmedman is undulating, i.e., flats and low ridges whose soil is red loam on the flats and clayey or shaley on the ridges. On many of these ridges ironstone and quartzite pebbles are mixed in the soils. On these ridges the red Ironbark tree (*Eucalyptus sideroxylon*) is usually very predominant and in my list I have called them Ironbark Ridges, which with the low ground at the foot thereof I have abbreviated into the symbol "I.B.R.," and these are found round Temora and Barmedman and even in the Mallee scrub at Wyalong. In several places between Temora and Barmedman there are fairly high hills of Granite rock rising from low flats which contain rotted granite as a notable part of their composition. This is the haunt of the Currawong Wattle (*Acacia doratoxylon*) and others and I abbreviate these hills and their foothills as "G.H." The intervening Flats are either red loamy soil washed down from the hills and marked in my lists as "R.S.F.," *i.e.,* Red Soil Flats, or they are what are known as Black Soil Plains (B.S.P.), consisting of tough clayey limey black stuff that sticks like glue when wetted. These are often pitted with shallow depressions called "Gilgais" or "Coolamon Holes," which in wet seasons become lakelets and swampy. From Barmedman to Wyalong these plains are numerous besides similar patches near Temora. On these are found water loving plants like the "Myall or Boree" Wattle (*Ac. pendula*). With this introduction I think my list may be easier of comprehension.

I take this opportunity of thanking the staff at the National Herbarium in the Gardens and especially their venerable chief, Mr. J. H. Maiden, for their patience and courteous attention in helping me to determine the species I had collected.

Imported residents of the floral area I have attempted to survey, are indicated with an asterisk.

CLASS 1.—CRYPTOGAMS.

AGARICACEAE.

Agaricus campestris.
Stropharia semiglobata, Barmedman.
Cantharellus cibarius, Barmedman.
Russula sp., Barmedman.

POLYPORACEAE.

Polystictus cinnabarina.

LYCOPERDACEAE.

Battarrea phalloides, Barmedman.
Mycenastrum corium, Barmedman.

HELVELLACEAE.

Morchella conica, Barmedman.

MARSILEACEAE.

Marsilea Hirsuta, R.Br.

POLYPODIACEAE.

Cheilanthes tenuifolia.

PINACEAE.

Callitris robusta, R.Br., R.S.F.
Callitris calcarata, R.Br., R.S.H.

CLASS 2.—MONOCOTYLEDONEAE.

JUNCAGINACEAE.

Triglochin procera, R.Br., Barmedman, Waterholes, B.S.P.

ALISMATACEAE.

Damasonium australe, Salisb., Barmedman, Waterholes, B.S.P.

Damasonium minus, R.Br.

GRAMINEAE.

Panicum decompositum, R.Br., passim, R.S.F.
Panicum miliaceum L.,* passim, R.S.F.
Stipa setacea, R.Br., passim, R.S.F.
Stipa semibarbata, R.Br., passim, R.S.F.
Stipa aristiglumis, F.v.M., passim, R.S.F.
Stipa scabra, Lindl, passim, R.S.F.
Agrostis Solandri, F.v.M., passim, R.S.F.
Calamagrostis aemula, Steud, passim, R.S.F.
Dichelachne crinita, Endl, passim, R.S.F.
Amphibromus Neesii, Steud, Barmedman, I.B.R.
Danthonia penicillata, F.v.M., Barmedman, I.B.R.
Cynodon Dactylon, Rich, passim, sandy soil.
Chloris acicularis, Lindl, passim, damp places.
Eragrostis Brownii, Nees-, Barmedman, I.B.R.
Eragrostis pellucida, R.Br., Barmedman, I.B.R.
Poa caespitosa, Forst, passim, I.B.R.
Festuca bromoides L.,* passim, I.B.R.
Festuca ciliata, DC.,* passim, I.B.R.
Bromus tectorum L. var. longipilus,* passim, I.B.R.
Bromus, mollis L.,* passim, I.B.R.
Bromus unioloides, Hunb.,* passim, I.B.R.
Agropyrum scabrum, Beauv,* passim, I.B.R.
Hordeum murinum, Cass,,* passim, Flat lands.
Aira caryophylla, L.,* Temora, I.B.R.
Briza minor, L.,* Temora, damp places.
Lamarckia aurea,* Moench., Barmedman, B.S.P.

CYPERACEAE.

Cyperus Gunnii, Hook, Barmedman, B.S.P.
Cyperus tenellus, L., Barmedman, B.S.P.
Scirpus setaceus, L., Barmedman, B.S.P.

JUNCACEAE.

Juncus bufonius, L., passim, water courses.
Juncus pallidus, R.Br., passim, water courses .
Juncus radula, Buch, Barmedman, B.S.P.

LILIACEAE.

Anguillaria dioica, R.Br., passim, R.S.F.
Bulbine bulbosa, Haw, Temora, R.S.F.
Bulbine semibarbata, Haw, Temora, R.S.F.
Thysanotus tuberosus, R.Br., Wyalong, B.S.P.
Thysanotus Patersoni, R.Br., Temora, I.B.R.
Dichopogon strictus, Bak., Temora, R.S.F.
Tricoryne simplex, R.Br., Temora, R.S.F.
Stypandra glauca, R.Br., Temora, G.H.
Dianella revoluta, R.Br., Temora, I.B.R.
Laxmannia gracilis, R.Br., Barmedman, G.H.
Xerotes multiflora, R.Br., passim, I.B.R.
Xerotes filiformis, R.Br., passim, I.B.R.
Xanthorrhoea australis, R.Br., passim, I.B R.
Muscari comosum Mill.,* Temora, Town lands.
Muscari racemosum, Mill.,* Temora, Town lands.

AMARYLLIDACEAE.

Calostemma purpureum, R.Br., Barmedman, Sandy creek banks.

Hypoxis glabella, R.Br., Barmedman, grass lands.

ORCHIDACEAE.

Calochilus campestris, R.Br., Temora, I.B.R.
Diuris maculata, Sm., Temora, I.B.R.
Microtis porrifolia, R.Br., Temora, I.B.R.
Pterostylis reflexa, R.Br., Temora, I.B.R.
Pterostylis rufa, R.Br., var. Mitchelli, Bth., Temora, I.B.R.
Caladenia testacea, R.Br., Temora, I.B.R.
Glossodia major, R.Br., Temora, I.B.R.
Glossodia minor, R.Br., Temora, I.B.R.

CLASS 3.—DICOTYLEDONEAE.

CASUARINEAE.

Casuarina stricta, Ait, Barmedman, B.S.P.

Casuarina paludosa, Sieb, Temora, I.B.R.

Casuarina lepidophloia, F.v.M., Barmedman, G.H. and B.S.P.

Casuarina Luehmanniana, R. T. Baker, Barmedman, G.H. and B.S.P.

URTICACEAE.

Urtica urens, L.,* passim, cultivation.
Parietaria debilis, G. Forst, Temora, R.S.F.

PROTEACEAE.

Persoonia rigida, R.Br., Barmedman, G.H.
Grevillea floribunda, R.Br., passim, I.B.R.
Grevillea parviflora, R.Br., Temora, I.B.R.
Hakea vittata, R.Br., Barmedman, B.S.P.

SANTALACEAE.

Exocarpus cupressiformis, Labill., Temora, I.B.R.
Fusanus acuminatus, R.Br., Temora, I.B.R.

LORANTHACEAE.

Loranthus linophyllus, Fenzl., Barmed., on Casuarina.
Loranthus eucalyptifolius, Temora, on Eucalyps.
Loranthus miraculosus, Miq., Temora, on Fusanus.
Loranthus Miquelii, Lehm., Temora, on Eucalyptus.

POLYGONACEAE.

Rumex pulcher, L.,* Temora, in town wastes.
Rumex crispus, L.,* Temora, in town wastes.
Polygonum aviculare, L.,* Temora, in town wastes.

CHENOPODIACEAE.

Rhagodia nutans, R.Br., passim, I.B.R.
Chenopodium triangulare, R.Br., passim, I.B.R.
Chenopodium carinatum, R.Br., Barmedman, B.S.P.
Chenopodium cristatum, F.v.M., Barmedman, B.S.P.
Chenopodium triandrum, Forst, Barmedman, B.S.P.
Chenopodium album, L.,* passim, cultivation.
Atriplex semibaccatum, R.Br., Barmedman, B.S.P.
Kochia humillima, F.v.M., passim, I.B.R.
Kochia microphylla, F.v.M., Barmedman, B.S.P.
Salsola Kali, L., passim, B.S.P.

AMARANTACEAE.

Ptilotus exaltatus, Nees, var. semilanatus, F.v.M., Barmedman, B.S.P.
Ptilotus spathulatus, Poir, Temora, B.S.P.
Amarantus Mitchelli, Bth., Temora, town lands.
Alternanthera triandra, Lam., Temora, town lands.

AIZOACEAE OR FICOIDEAE.

Mollugo hirta, Thunb., Barmedman, near water, B.S.P.

PORTULACACEAE.

Calandrinia pusilla, Lindl., passim, I.B.R.

CARYOPHYLLACEAE.

Stellaria media, L.,* passim, grass lands.
Sagina apetala, Ard., Temora, town lands.
Spergularia rubra, Camb., passim, town lands.
Silene gallica, L.,* passim, town lands.
Cerastium vulgatum, L.,* passim, town lands.
Dianthus prolifer, L.,* passim, town lands.

RANUNCULACEAE.

Myosurus minimus, L., Temora, R.S.F.
Ranunculus hirtus, Bks. and Sol., Temora, R.S.F.
Ranunculus parviflorus, L., Temora, R.S.F.
Ranunculus muricatus, L.,* Temora, damp lands.

LAURACEAE.

Cassytha pubescens, R.Br., Temora, on Melaleuca erubescens Otto.

Cassytha phaeolasia, F.v.M., Temora, on Melaeuca erubescens Otto.

PAPAVERACEAE.

Papaver aculeatum, Thumb., passim, in cultivation.
Fumaria officinalis, L.,* passim, in cultivation.

CAPPARIDIAE.

Apophyllum anomalum, F.v.M., Wyalong, B.S.P.

RESEDACEAE.

Reseda luteola, L.,* Barmedman, in grass lands.

CRUCIFERAE.

Alyssum minimum, Pallas, Barmedman, B.S.P.
Blennodia lasiocarpa, F.v.M., passim, in cultivation.
Sisymbrium officinale, L.,* passim, in cultivation.
Sisymbrium orientale, L.,* passim, in cultivation.
Stenopetalum lineare, R.Br., Barmedman, B.S.P.
Lepidium ruderale, L., passim, Town lands.
Lepidium pseudo-ruderale, Thell., passim, Town lands.
Lepidium dubium, Thell., Barmedman, Town lands.

DROSERACEAE.

Drosera peltata, Sm., Barmedman, G.H.

CRASSULACEAE.

Tillaea verticillaris, DC., passim, R.S.F.
Tillaea macrantha, Hook. f., passim, R.S.F.

PITTOSPORACEAE.

Pittosporum phyllyræoides, DC., passim, I.B.R.
Marianthus procumbens, Bth., Temora, I.B.R.
Bursaria spinosa, Cav., Temora, R.S.F.
Cheiranthera linearis, A. Cunn., Temora, I.B.R.

LEGUMINOSAE.

(*a*) MIMOSOIDEAE.

Acacia aspera, Lindl, Temora, I.B.R.
Acacia armata, R.Br., Temora, I.B.R.
Acacia vomeriformis, A. Cunn., Temora, I.B.R.
Acacia obliqua, A. Cunn., Temora, I.B.R.
Acacia lineata, A. Cunn., passim, I.B.R.
Acacia flexifolia, A. Cunn., passim, I.B.R.
Acacia montana, Bth., Temora, R.S.F.
Acacia verniciflua, A. Cunn., Barmedman, I.B.R. and G.H.
Acacia penninervis, Sieb., Barmedman, G.H.
Acacia difformis, R. T. Baker, passim, I.B.R.
Acacia hakeoides, A. Cunn, passim, I.B.R.
Acacia decora, Reichb., Temora, R.S.F.
Acacia amblygona, A. Cunn., Barm. and Tem., I.B.R.
Acacia homalophylla, A. Cunn., Barmedman, B.S.P.
Acacia pendula, A. Cunn., Barmedman, B.S.P.
Acacia Oswaldi, F.v.M., Barmedman, B.S.P.
Acacia implexa, Bth., Temora, near G.H.
Acacia doratoxylon, A. Cunn, Barm. and Tem., G.H.
Acacia Baileyana, F.v.M., Temora, I.B.R.
Acacia Muelleriana, Maiden and R. T. Baker, Temora, I.B.R.
Acacia decurrens, Willd. var. normalis, Bth., Temora, I.B.R.
Acacia decurrens, var. mollis, Lindl, passim, I.B.R.
Acacia dealbata, F.v.M., passim, near creeks.
Acacia cardiophylla, A. Cunn., Tem. and Wyalong, I.B.R.

(*b*) CAESALPINIODEAE.

Cassia eremophila, A. Cunn., Tem. and Barm., I.B.R.

(*c*) PAPILIONATAE.

Daviesia corymbosa, SM., var., mimosoides, Bth., Temora, I.B.R.
Daviesia ulicina, Sm., Temora, I.B.R.
Daviesia genistifolia, A. Cunn., Barmedman, B.S.P.

Pultenaea daphnoides, Bth., Temora, I.B.R.

Pultenaea largiflorens, F.v.M., Temora, G.H., new for N.S.W.

Eutaxia empetrifolia, Schlecht, Temora, B.S.P.

Dillwynia floribunda, Sm., var. sericea, Bth., Temora, I.B.R.

Hovea linearis, R.Br., Temora, I.B.R.

Goodia lotifolia, Salisb, Temora, I.B.R.

Indigofera australis, Willd, passim, I.B.R.

Indigofera coronillifolia, A. Cunn., Temora, I.B.R.

Swainsona oncinotropis, F.v.M., Temora, B.S.P.

Swainsona tephrotricha, F.v.M., Temora, I.B.R.

Kennedya monophylla, var. alba, passim, I.B.R.

Trifolium, tomentosum, L.,* Temora, B.S.P.

Trifolium arvense, L.,* Temora, B.S.P.

Trifolium procumbens, L.,* Temora, B.S.P.

GERANIACEAE.

Geranium pilosum, Forst., Temora, near G.H.

Erodium cygnorum, Nees, Temora, I.B.R.

Erodium moschatum L'Herit.,* passim, Grass lands.

Erodium cicutarium L'Herit.,* passim, Grass lands.

OXALIDACEAE.

Oxalis corniculata, L., passim, Grass lands.

LINACEAE.

Linum marginale, A. Cunn., Temora, B.S.P.

ZYGOPHYLLACEAE.

Zygophyllum apiculatum, F.v.M., Barmedman, B.S.P.

Zygophyllum ammophilum, F.v.M., Barmedman, B.S.P.

Tribulus terrestris, L., Temora, Town lands.

RUTACEAE.

Zieria aspalathoides, A. Cunn., Temora, I.B.R.

Eriostemon myoporoides, DC., Temora, G.H.

Philotheca australis, var. parviflora, Bth., Barmed. and Wyalong, I.B.R.

EUPHORBIACEAE.

Phyllanthus thymoides, Sieb, passim, I.B.R.

Euphorbia Drummondii, Boiss., Temora, Town lands.

Poranthera microphylla, Brogn., Temora, I.B.R.

Beyeria viscosa, Miq., Temora, G.H.

Bertya Cunninghami, Planch., Barmedman, B.S.P.

STACKHOUSIACEAE.

Stackhousia linariifolia, A. Cunn., passim, I.B.R.

SAPINDACEAE.

Heterodendron oleaefolium, Desf., Barmedman, B.S.P.

Dodonaea viscosa, Jacq., var. spathulata, Bth., passim, I.B.R.

Dondonaea cuneata, Sm., Barmedman, B.S.P.

Dodonaea calycina, A. Cunn., var., heterophylla, M. & B., Barmedman, I.B.R.

MALVACEAE.

Sida corrugata, Lindl., passim, R.S.F.

Malva parviflora, L.,* passim, Town lands.

STERCULIACEAE.

Brachychiton populneus, R.Br., passim, G.H.

DILLENIACEAE.

Hibbertia stricta, R.Br., Temora, I.B.R.

Hibbertia linearis, R.Br., var., obtusifolia, Bth., Temora, I.B.R.

VIOLACEAE.

Hybanthus filiformis, F.v.M., Barmedman, G.H.

THYMELAEACEAE.

Pimelea linifolia, Sm., Temora, I.B.R.

Pimelea curviflora, R.Br., Temora, I.B.R.

LYTHRACEAE.

Lythrum hyssopifolium, L., Temora, R.S.F.

MYRTACEAE.

Eucalyptus macrorrhyncha, F.v.M., passim, I.B.R.

Eucalyptus melliodora, A. Cunn., passim, R.S.F.

Eucalyptus sideroxylon, A. Cunn., passim, I.B.R.

Eucalyptus populifolia, Hook, Barmedman, I.B.R.

Eucalyptus hemiphloia, var. albens, F.v.M., passim, G.H., R.S.F.

Eucalyptus hemiphloia, var. microcarpa, Maiden, passim, R.S.F.

Eucalyptus Behriana, F.v.M., Wyalong, Mallee scrub.

Eucalyptus viridis, R. T. Baker, Wyalong, Mallee scrub.

Eucalyptus fruticetorum, F.v.M., Wyalong, Mallee scrub.

Eucalyptus dumosa A. Cunn., Wyalong, Mallee scrub.
Eucalyptus rostrata, Schlecht, passim on creeks.
Eucalyptus dealbata, A. Cunn., passim, I.B.R.
Kunzea corifolia, Reichb., Barmedman, G.H.
Melaleuca parviflora, Lindl, Barmedman, I.B.R.
Melaleuca uncinata, R.Br., Barmedman, B.S.P.
Melaleuca ericifolia, Sm., var., erubescens, Bth., Temora, I.B.R.
Calycothrix tetragona, Labill, Temora, I.B.R.

HALORRHAGACEAE.

Halorrhagis elata, A. Cunn., Temora, I.B.R.

UMBELLIFERAE.

Hydrocotyle laxiflora, DC., Temora, I.B.R.
Hydrocotyle callicarpa, Bunge, Temora, I.B.R.
Trachymene Billardieri var. lanceolata, Bth., Temora, I.B.R.
Daucus brachiatus, Sieb., Temora, G.H.

EPACRIDACEAE.

Styphelia humifusa, Pers, Temora, I.B.R.
Styphelia urceolata, F.v.M., Temora, I.B.R.
Styphelia strigosa, Sm., passim, I.B.R.
Brachyloma daphnoides, Bth., passim, I.B.R.
Sprengelia incarnata, Sm., Temora, I.B.R.

PRIMULACEAE.

Anagallis arvensis, L.,* Temora, R.S.F.

ASCLEPIADACEAE.

Pentatropis quinquepartita, Benth., Barmedman, I.B.R.

CONVOLVULACEAE.

Convulvulus erubescens, Sims, passim, R.S.F.

BORRAGINACEAE.

Heliotropium europaeum, L., Temora, R.S.F.
Lappula concava, F.v.M., Temora, R.S.F.
Rochelia Maccoya, Reichb., Temora, R.S.F.
Cynoglossum suaveolens, R.Br., Temora, R.S.F.
Echium violaceum, L.,* passim, near Railway.
Lithospermum arvense, L.,* in cultivations.

VERBENACEAE.

Verbena officinalis, L., Barmedman, B.S.P.

LABIATAE.

Mentha satureoides, R.Br., Temora, R.S.F.
Salvia verbenacea, L.,* Temora, Town lands.
Prostanthera ovalifolia, R.Br., Barmedman, G.H.
Prostanthera denticulata, R.Br., Temora, I.B.R.
Prostanthera coccinea, F.v.M., Wyalong, I.B.R.
Ajuga australis, R.Br., Barmedman, B.S.P.

SOLANACEAE.

Solanum nigrum, L., passim, in cultivations.
Solanum aviculare, Forst, Barmedman, in cultivations.
Solanum simile, F.v.M., passim, in cultivations.
Solanum esuriale, Lindl, Barmedman, B.S.P.
Solanum cinereum, R.Br., passim, R.S.F.
Nicotiana glauca, Grah.,* passim, G.H.
Anthocercis albicans, A. Cunn., Temora, I.B.R.

SCROPHULARIACEAE.

Mimulus gracilis, R.Br., Barmedman, B.S.P.
Veronica calycina, R.Br., Barmedman, B.S.P.
Veronica serpillifolia, L., Barmedman, B.S.P.

MYOPORACEAE.

Myoporum deserti, A. Cunn., passim, I.B.R.
Myoporum debile, R.Br., Temora, B.S.P.
Eremophila oppositifolia, R.Br., Wyalong, B.S.P.
Eremophila longifolia, F.v.M., passim, I.B.R.

PLANTAGINACEAE.

Plantago varia, R.Br., passim, R.S.F.
Plantago coronopus, L.,* Temora, B.S.P.
Plantago major, L.,* Temora, R.S.F.

RUBIACEAE.

Asperula oligantha, F.v.M., passim, Grass lands.

CUCURBITACEAE.

Cucumis myriocarpus, Naud.,* passim, in cultivations.

CAMPANULACEAE.

Lobelia gibbosa, Labill, Temora, G.H.
Lobelia purpurascens, R.Br., Temora, G.H.
Isotoma axillaris, Lindl, Barmedman, G.H.
Wahlenbergia gracilis, Schrad., passim, all soils.

GOODENIACEAE.

Goodenia ovata, Sm., Temora, I.B.R.
Goodenia hederacea, Sm., Temora, I.B.R.
Goodenia pinnatifida, Schlecht., Temora, I.B.R.
Dampiera lanceolata, A. Cunn., Temora, G.H.
Brunonia australis, Sm., Barmedman, G.H.

CANDOLLEACEAE (STYLIDIACEAE).

Candollea serrulata, Labill, Temora, I.B.R.

COMPOSITAE.

Olearia ramulosa, Bth., Temora, I.B.R.
Olearia floribunda, Bth., Temora, I.B.R.
Olearia pimelioides, Bth., Temora, I.B.R.
Olearia iodochroa, F.v.M., Wyalong, I.B.R.
Olearia adenophora, F.v.M., Barmedman, I.B.R.
Vittadinia australis, Rich., passim, flat lands.
Vittadinia australis, var. tenuissima, Bth., passim, flat lands.
Erigeron linifolium, L.,* passim, town lands.
Calotis cuneifolia, R.Br., passim, flat lands.
Calotis lappulacea, Bth., Temora, I.B.R.
Calotis microcephala, Bth., Wyalong, I.B.R.
Brachycome pachyptera, Turcz, Wyalong, I.B.R.
Brachycome trachycarpa, F.v.M., Temora, I.B.R.
Brachycome exilis, Sond., Temora, R.S.F.
Siegesbeckia orientalis, L., Temora, G.H.
Cotula australis, Hook., Temora, in grass lands.
Centipeda Cunninghamii, F.v.M., passim, in water courses.
Isoetopsis graminifolia, Turcz, Temora, B.S.P.
Myriocephalus rhizocephalus, Bth., Temora, I.B.R.
Calocephalus Lessingii,—forma citreus, F.v.M., Barmedman, I.B.R.
Gnaphalodes uliginosum, A. Gray, passim, near I.B.R.
Craspedia Richea, Cass, passim, B.S.P.
Craspedia chrysantha, Bth., Barmedman, B.S.F.
Cassinia aculeata, R.Br., passim, I.B.R.
Cassinia arcuata, R.Br., Passim, I.B.R.
Millotia tenuifolia, Cass, Temora, R.S.F.
Podolepis acuminata, R.Br., Barmedman, B.S.P.
Leptorrhynchos panaetioides, Bth., Barmedman, B.S.P.
Leptorrhynchos, pulchellus, F.v.M., Barmedman, B.S.P.
Helichrysum lucidum, Henck., passim, flat lands.

Helichrysum apiculatum, DC., passim, I.B.R.
Helichrysum semipapposum, DC., passim, I.B.R.
Helichrysum diotophyllum, F.v.M., Barmedman, B.S.P.
Helichrysum obcordatum, F.v.M., Temora, I.B.R.
Helipterum floribundum, DC., passim, B.S.P.
Helipterum incanum, DC., Temora, I.B.R.
Helipterum Jesseni, F.v.M., Barmedman, G.H.
Helipterum corymbiflorum, Schlecht., passim, B.S.P.
Helipterum pygmaeum, Bth., Barmedman, B.S.P.
Helipterum exiguum, F.v.M., Temora, near G.H.
Helipterum dimorpholepis, Bth., Temora, I.B.R.
Gnaphalium luteo-album, L., passim, I.B.R.
Gnaphalium japonicum, Thumb., passim, I.B.R.
Stuartina Muelleri, Sond., passim, I.B.R.
Erechtites prenanthoides, DC., Temora, I.B.R.
Erechtites arguta, DC., Temora, I.B.R.
Senecio lautus, Soland., Barmedman, G.H.
Cymbonotus Lawsonianus, Gaud., passim, B.S.P.
Centaurea melitensis, L.,* passim, in cultivations.
Microseris Forsteri, Hook., passim, in grass lands.
Sonchus oleraceus, L.,* passim, in grass lands.
Hypochaeris glabra, L.,* passim, in grass lands.
Hedypnois cretica, Willd.,* Barmedman, B.S.P.
Cryptostemma calendulaceum, R.Br.,* passim, in grass lands.

EXCURSION TO WATSON'S BAY.

Thirty-two members attended on April 9th, and were met at the wharf by the leader Mr. D. G. Stead. The party first viewed the "Gap," and then proceeded to the reef, where the rock pools were examined. A number of specimens were collected, the leader supplying interesting details of the habits and structure of the animals captured. An adjournment was made to the residence of Mr. Stead, and an inspection of his extensive library disclosed some rare works on piscatorial subjects. Mrs. Stead kindly entertained the party to afternoon tea, after which a visit was made to Camp Cove, where the leader gave an interesting account of some of the prominent topographical and historical features of the district.

A.A.H.

The Australian Naturalist

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

NOTICE TO MEMBERS.

It is particularly requested that members exhibiting specimens will hand to the Hon. Secretary a written list thereof with notes, for publication in the *Naturalist*. In this way only will it be possible to record the notes and exhibits at our meetings.—Ed.

ORDINARY MEETINGS.

June 7th, 1921.—The President (Mr. A. G. Hamilton) in the chair. Misses C. T. Greig and M. Holland and Mrs. J. H. Parry were duly elected members. Mr. Finckh announced that he had received the sad news of the death of Mr. C. Gaggin, a regular attendant at our meetings and excursions. The meeting was an open one for members. Mr. Finckh exhibited a lateral shoot taken from *Agave acuminata* which had produced a short flower spike, and asked if it was usual for these laterals to flower at the same time as the main shoot which produces a long spike, which, after the seeds have set, collapses and withers. It was generally agreed that the occurrence was not common, as usually only the main shoot produces a flower spike.

Mr. Finckh also read abstracts from a work on gold fish, and exhibited specimens and drawings.

Miss Drummond exhibited a specimen of breccia from the Hornsby volcanic neck, showing that the coal-like enclosures are not coal, but wood.

Mr. Cheel read an account published in the *Sydney Morning Herald,* May 25th, 1921, under the heading:—"A Mammoth Mushroom," which had been collected near Goulburn, measuring 42 inches in circumference, 13 inches in diameter, and with a stem 2¾ inches in thickness. Mr. Cheel stated that this was not by any means the largest on record. The

Sydney *Evening News,* April 10th, 1913, recorded a mushroom taken near Springvale, Victoria, measuring 56½ inches in circumference, and 27 inches around the stalk, and weighing 13 lbs. 2 oz. He also showed a photograph of a giant mushroom published in the *Canterbury Times,* England, November 11th, 1912, measuring 3 feet 4 inches at greatest circumference, and weighing 7 lbs. 4 oz. This latter was taken at Chadwell Heath, 10 miles from London, and was exhibited at the Covent Garden market. In the *Garden,* August 21st, 1915, p. 408, it is recorded that a specimen of *Lycoperdon giganteum* (Puff-ball family) measured 42 inches in circumference.

Miss Butler exhibited several fresh fungi, collected at Berowra, which were determined by Mr. Cheel as follows:—*Geaster saccata* commonly called "Earth stars," *Scleroderma flavidum* occasionally called "Swagman's Puff-powder," it being stated that when applied to chafed feet the mass of spores has a soothing effect; of the Polyporaceae were *Polystictus cinnabarinus, P. oblectans, Hexagona tenuis, Fomes robusta* and *Ganoderma applanatus.* Several Agaricaceae and Thelephoraceae were exhibited as well as *Clanaria.* The latter is frequently called the "Cauliflower fungus" on account of its resemblance.

Mr. P. D. Murray gave an account of Flagellatae in an infusion which had been kept in darkness and exhibited the phenomenon of clustering round the edge of a cover glass, suggesting what is known as oxygeotaxis.

July 5th.—Mr. A. G. Hamilton, President, in the chair. Miss E. Perrin and Mrs. A. E. Cregan were elected members. An invitation from the President and Secretary of the Microscopical Society to attend their annual meeting was read and accepted.

Dr. W. K. Gregory, of New York, delivered a lecture, "Glimpses of Evolution." The lecture, which was illustrated with a well chosen series of lantern slides, was listened to with close attention by the large audience. A report is given on another page.

Mr. A. S. le Souef exhibited a living *Phascologall* and *Moloch horridus*; Mr. Burrell, Platypus, with eggs; Miss Roseby, a feather-star; Mr. Watson, a large land snail (*Helix Falconari*) from the North Coast.

August 2nd, 1921.—Mr. A. G. Hamilton, President, in the chair. This was merely a meeting for exhibition of specimens, following the Annual Meeting.

Mr. L. Gallard exhibited a series of *Acacia* specimens of ecological interest. Mr. Cheel, on behalf of Mr. Anderson, a double flowering form of *Boronia ledifolia,* from Chatswood. Miss Steinbach, specimens of Edelweiss (*Leontophorum alpinum*) and Cotton grass (*Eriophorum angustifolium*) from the Swiss Alps.

NINTH ANNUAL MEETING.

August 2nd, 1921.—The President, Mr. A. G. Hamilton, presiding. After the usual formal business was disposed of, Mr. Hamilton delivered the Annual address, entitled: "Notes on the Orchids of New South Wales." The address was illustrated with lantern slides, showing the beauty and interest of our orchids. A summary of the address is given in this number. On the motion of Mr. Stead, seconded by Mr. E. S. Edwards, a cordial vote of thanks was given by acclamation. The list of office-bearers for the new session will be found on inside cover of the *Naturalist.*

ANNUAL REPORT OF COUNCIL FOR 1920-1921.

It gives me very great pleasure to submit the following report on behalf of the Council. The September meeting opened with a discussion on Miss Le Plastrier's Presidential Address. The following lectures and papers were contributed during the year:—Crosslands, D. W. C. Shiress; The Ooldea Wonderland, D. G. Stead; Some Notes on *Kochia villosa* var *tenuifolia,* Archdeacon F. E. Haviland; Natural History of the Hawaiian Islands, C. Hedley; An Entomological Trip to West Australia, G. M. Goldfinch; Notes on Papua, P. D. Murray; Notes on Lord Howe Island, A. R. McCulloch; Glimpses of Evolution; Dr. W. K. Gregory.

The November, March and June meetings were member's meetings for exhibition of specimens, reading of notes, and informal discussion, and were very popular and profitable.

During the year 15 ordinary and 1 country members were elected, 1 member, Mr. C. Gaggin, has passed away. He was a regular attendant of our meetings, in which he took a deep interest. The Council greatly regrets his loss.

Four parts of our official journal, "The Australian Naturalist," have been published during the year. We are indebted to the Hon. Editor, Mr. T. Steel, for his services in maintaining the high standard of the journal.

Mr. P. D. Murray, the Hon. Librarian, has completed a catalogue of the books and periodicals, which it is proposed to have printed.

EDWIN CHEEL,
Hon. Secretary.

NOTES ON THE ORCHIDS OF NEW SOUTH WALES.

SUMMARY OF PRESIDENTIAL ADDRESS BY A. G. HAMILTON.

Orchids are the most beautiful and interesting of our native plants. Their wonderful structure, bizarre shapes, and brilliant coloring impress even the most casual observer. They are very well worth observing on this account, and from the fact that they are gradually passing away, particularly in the neighborhood of Sydney. The clearing of suburban lands for building has wiped out many species once common. They appear to have very little power of resistance. When land is broken up, many native plants spring up again, either from the roots or from seeds lying in the ground. But the orchid roots when disturbed, do not recover, and although they produce innumerable seeds, seedling plants are very rare. The seeds are so minute that only under an extraordinarily rare set of circumstances do they ever germinate.

Curiously enough, one of our rarer orchids—*Spiranthes Australis*—does appear to be able to recover from disturbance. I have found plants in a field which had been cultivated, on the side of a railway embankment, and once near Bell railway station, growing among the stones between the rails.

They are very widely distributed, being found all over the world except in the Frigid Zones, and in the tropics they are particularly plentiful and very gorgeous.

New South Wales is rich in species, 176 distributed among 39 genera. Some are very restricted in their habitat. In a sheltered gully near Mudgee, I once found a patch of leaves which I took to be *Corysanthes,* but on mentioning it to the late Mr. R. D. Fitzgerald, he told me it was very unlikely as none of the genus had been found west of the mountains. However, I watched the clump for eight years, and at the end of that time, had the satisfaction of finding a few plants in flower, and it proved to be a new species of *Corysanthes.*

Mr. Fitzgerald collected, within a radius of one mile from Hunter's Hill, 62 species, 57 being terrestrial. And I collected in a five mile radius at Guntawang, near Mudgee, 60 species, 57 being terrestrial. None of our native orchids are so beautiful as the exotic species cultivated by orchid lovers in hot houses, but they are none the less very beautiful.

They are easy plants to identify, even children recognise them readily. The observer soon develops what Dr. Rogers calls the "orchid eye" and spots them with ease.

The structure of the flower is very constant. Like all monocotyledons, their perianth is in threes, three sepals outside and three petals inside. The lowest petal, in most, is highly developed. It has a different shape and is more ornamental, and may have ridges or other ornamental outgrowths. It is called the labellum or lip. The essential organs are combined into one mass, consisting of two anthers, and a stigma. This compound organ is called the column. The pollen, instead of being composed of separate minute grains, is in masses called pollinia, either waxy, or powdery with the grains held together by a network of fine threads.

We may divide our orchids into two groups, epiphytes, and terrestrial orchids. Epiphytes are those plants which grow on trees, or rocks, and have their roots more or less exposed to the air—aerial roots. They are easy of cultivation; will grow fastened on a piece of wood, or bark or virgin cork, but should have a padding beneath of fibrous peat. But they will do better in a mixture of leaf mould and charcoal, topped with Sphagnum moss. If grown in this mixture in pots, they should be well drained, as stagnant moisture is fatal to them.

The commonest genera are *Dendrobium, Bulbophyllum,* and *Sarcochilus.* The well-known rock-lily is the commonest of the Dendrobiums. It grows in soil well, but does equally well on rocks and branches of trees.

The terrestrial orchids, as the name implies, grow in the ground, and have for the most part, a double tuber—one formed last year, which throws up the flower-stalk, and at the same time a new one is formed, which flowers the following year, the old one dying off. Mr. E. Pescott has an interesting account of the tubers in a paper in the Victorian *Naturalist.*

The commonest genera are *Dipodium, Spiranthes, Calochilus, Thelymitra* (a genus which has no labellum), *Diuris, Prasophyllum, Microtis, Pterostylis, Caleana, Acianthus, Eriochilus, Lyperanthus, Caladenia* and *Glossodia.*

The lecture was illustrated by a number of colored lantern slides.

A FEW OBSERVATIONS ON GECKOS.

By Rose M. Winter.

Though known popularly as Rock Scorpions and believed by many to be poisonous, Geckos deserve neither their name nor their reputation. They are nocturnal lizards hiding by day in crevices of rocks and under bark, and coming forth at night to capture their food in the form of insects, etc. Some Geckos' feet are provided with suction pads, while others have small claws: to the latter class belongs *Gymnodactylus platurus* —the Gecko common around Sydney and frequently seen on rocks or walls at night. *G. platurus* does not grow much more than 6in. long, from the tip of the nose to the end of the spine on the heart shaped tail; the skin is covered with tubercles, the eyes are large and prominent.

Now, a most curious fact about Geckos is their ability, when pursued or hard pushed in a fight, to throw off the rather cumbersome tail and escape. The tail, on being detached from the body, squirms vigorously for a considerable time—this is often sufficient to distract the attention of the pursuer while Gecko, minus his tail, makes good his escape. Another tail will grow, but is always different in skin texture, and sometimes in shape, to the first or perfect tail, and one can always tell whether a Gecko has an original or subsequent tail. Whether there is any limit to the number of times the tail can be replaced, and whether there would be any difference in skin texture between, say, a second and third or fourth tail, remains to be proved. The new tail appears first in the form of a button, dark-bluish in colour and very smooth; when it grows it is frequently wider than the first tail and always smoother—not having the large tubercles on the skin.

In order to learn more of the habits of these interesting little lizards, the writer kept Geckos in captivity for a period of five and a half years, commencing in October, 1912. The longest time any individual Gecko was kept was about four years. During the time mentioned 42 specimens of G. platurus were captured and kept in captivity for various periods. In the case of each one a record of the size and type of tail (that is, whether "first," "second," or "button"—a very young tail) was made. An analysis of these records regarding the type of tail shows the following interesting result:—

Thus only 37½ % of the Geckos classified as "Full grown" had the first tail, while the remainder had either a "second" tail or none at all: of those classified as "Young, half-grown and Nearly Full Grown," 83 1-3 % still had the first tail, indicating that the younger ones—as a class—had not gone through experiences leading to the throwing off of the tail to anything like the extent that the full grown ones had.

Records were kept of the growth of some of the younger Geckos caught with the following result:—

Growth.—A specimen caught on Nov. 6th, 1912, measured 2⅝in. from tip of nose to end of tail: when re-measured a year later its total length was 4in.

Another young Gecko which measured 2¼in. when captured, showed a growth of 1¼in. in three months—this is much quicker than the average.

Casting of Skin.—The Geckos slough off the epidermis at intervals and pieces of the white, lace-like material can sometimes be seen caught in spiders' webs under overhanging rocks—often the epidermis of the foot will come off in one piece, the toes looking like the fingers of a pair of fairy's gloves. A few records of the regularity, or irregularity, of this casting of the skin, were as follows:—A young Gecko (the one first mentioned under the heading of Growth) was observed to cast the skin regularly every two months for a period of a year then change the skin for two months running and then miss altogether for four months. Another one which was about half grown changed its skin on the 7th March, 10th May, 2nd June, 11th September, 20th October, 17th November, and 7th December (1913). A fully grown one changed its skin in March, September, January and November. However, one cannot infer from this that the full grown Geckos *always* cast the epidermis at much wider intervals than the younger ones—though many of them do—because another full grown Gecko was observed to change its skin two months running and after an interval of three months to again cast it two months running.

Breeding Habits.—Though the writer was unsuccessful in getting the Geckos to breed in captivity, on two occasions eggs were laid. They were about half an inch long, oval, with a tough white integument but not a hard shell. The second egg (they apparently only lay two) was laid about a month after the first. The eggs were deposited on pieces of wood or bark, to which they adhered. The developing eggs can be seen as faint white streaks showing through the skin of the ventral surface of the body, one on each side of the mid line. A few particulars regarding the method of catching and of keeping Geckos might prove interesting:—

Capture.—The Geckos are caught at night with the aid of a strong lantern flashed on the stone walls and rocks. If caught quickly with the naked hand they offer little resistance and are quite harmless. When disturbed, however, they sometimes put up the Scorpion-like tail as though to sting, and run away with a little startled cry, something ilke the sound one makes when the tongue is pressed against the roof of the mouth and suddenly withdrawn. The Gecko is one of the very few lizards with a cry or call of any kind.

Cages.—These were of the butter box and kerosene case type, with front of glass and top or one side of wire gauze. The interior was provided with stones arranged so as to give the Geckos opportunity to retire from the light in the day time; earth covered the bottom and a vessel of water was provided—though they were never seen drinking. Now and again a few tufts of growing grass were put in.

Food.—This proved a great problem, first to find out what they would eat, and then to get enough of it. All the types of food which other lizards sometimes eat in captivity (meat, raw and cooked, bread and milk, cooked vegetables, etc.) were refused by the Geckos. After trying several kinds of live insects it was found that the only food they would touch readily was live Slaters or Woodlice (Oniscidea), which are often seen crawling over rocks at night in the same situations in which the Geckos are found. The woodlice were collected at night, with the aid of a lantern, being knocked with a little twig into a billy-can and then liberated in the cages. The Geckos stalked the woodlice with great deliberation, often seeming to delay catching them just to watch them walk around, as a cat would a mouse. Attempts to breed the woodlice for food were only partly successful, and most of the ones fed to the Geckos were got by turning over stones in the day time or with a lantern and billy-can at night.

The Geckos hibernate during the coldest weather, and in one particularly cold winter about half a dozen of those kept in captivity perished. Though the majority hibernate there are always a few which do not seem to do so, both of those kept in cages and of those observed on the walls.

THE ORCHARD TREE SPIDER *CALAENIA EXCAVATA.*

The following interesting account of this spider is compiled from notes of observations sent in by Mr. W. A. Oakley, of Bondi, and read at the meeting in February last. The spider was identified by Mr. Froggatt. When I first noticed this spider, some twelve months since, it was about an eighth of an inch across the abdomen and was located on a leaf of a Christmas bush in my bush-house. It was always in the same spot and never seemed to move. Under a magnifying glass it resembled a crab with its legs folded across the thorax. The legs are white and black and the abdomen pure creamy white with black markings. After watching it daily for six months I took a light and examined it at night, when I found it hanging beneath the leaf by one leg to a fine web, and moving about the other legs as if exercising. On the part of the leaf where the spider had been sitting there was a closely woven mat of silver looking web. Next day the spider was back on the same spot just as I had seen it for months.

On going into the bush-house next night I found it hanging, swinging its legs as before. For weeks I observed it by day on top of the leaf and at night beneath, but could never see it feeding.

The plant started to grow in the Spring of this year, and I planted it out in the garden, near a small pepper tree, and still being interested in this spider, I lost sight of it for several days, and thought a bird must have had it, but later I discovered it had removed its abode on to a leaf of the pepper tree about three feet from the leaf of the Christmas bush. When I found it again it had still a small silver looking mat on the top side of the pepper tree leaf, and woven the same shape as on the other leaf, and in the day time it was always to be found resting in the same position on the silver looking spot or mat, while at night it was hanging under the leaf and active with its legs. This spider since it has been out in the open has grown considerably and some ten weeks since I noticed a perfectly round tan coloured ball with curious dark markings thereon was hung by a web to the leaf and the spider was attached to the ball, a week later a second ball was hung up to the first, and now every week since a new ball has been added, till there are now ten all the same colour and with similar markings on them. I have been curious to know where these balls came from and how they were made, and last evening, taking a gentleman into the garden to see the spider, I was rewarded and found the creature had a small yellow looking drop attached to the lower part of its body about the size of a small gun shot, it looked like a small yellow drop of honey. On returning with a light later I found the spider had removed this drop of honey looking substance and was holding it with its seven legs close to its mouth, while the creature was suspended to a web with one leg only, and it was turning the said drop of honey looking substance round and round. On looking at it with a glass I observed it was spinning a white silver looking web round this drop of honey looking substance and the ball soon became double its size. This process went on till the ball was made about 7/16ths of an inch in diameter, and still a pure silver white colour. A few minutes later this ball changed colour and I found it was being covered with a light tan coloured silk web, the ball then soon changed to a very dark tan colour and the same colour all over. The spider then held the ball out at arm's length and turned it round and round as if to see all was right. Then it brought the ball close to its mouth and began to decorate it with curious black and tan markings in straight lines across, as all the other balls had been marked, and after completing it it fastened it to the chain of other balls it had made which are all now hanging on the pepper tree.

A few days since I noticed the top ball of the chain of balls had a small hole in it about the size of a pin's head, and from this hole numerous minute spiders came out and were running backwards and forwards on two small single webs which were attached to the ball and a leaf of the tree some six inches away from the ball. On looking at these small spiders under a glass I found they were all like the parent spider, but most minute. But strange to say, now they have all disappeared, and I can come to no other conclusion than that the parent spider must have devoured them. There is no other spider like it on or near this tree, and how these young ones came is to me a mystery, unless both sexes are combined in this creature, which is now about ½ of an inch across the abdomen.

Last evening I found the second ball had a small hole in it like the top one, but no young spiders are yet to be seen about. On looking at the spider this morning, for the first time I found it feeding on what appears to me to be a bee moth.

NOTES ON THE SPINY GREEN PHASMA.

(*EXTATOSOMA TIARATUM.*)

Walter W. Froggatt, F.L.S.

Among the many curious and striking examples of protective mimicry found among the leaf or stick insects of the Family Phasmidae there is none more remarkable in form and colouration than that of *Extatosoma tiaratum.*

In the appendix to Captain Philip P. King's "Narrative of a Survey of the Intertropical and Western Coasts of Australia" which was published in London in 1827, W. S. Macleay worked out the Zoological collections and described this insect under the name of *Phasma tiaratum* giving a life size drawing of the typical adult green female. I have found a specimen of a female labelled "New Holland" in the Macleay Museum Collection which is probably this type.

In 1833 George Robert Gray, the then Secretary of the Entomological Society of London, issued the first part of his "Entomology of Australia," and in the introduction says, that he intends to publish a similar monograph on various groups of Australian Insects, each complete in itself, with eight plates, at intervals of about six months. This, however, was the only number published. This first memoir was entitled "A Monograph of the Genus *Phasma,*" with eight coloured plates, each containing two figures; upon the eighth plate he figured the male and female of this phasma, calling the female, previously described by Macleay "Macleay's Dilated-bodied Spectre" (*Extatosoma tiaratum*) and the slender winged male as a new species "Hope's Dilated-bodied Spectre" (*Extatosoma hopei.*)

As the male is figured life size, the female is so much smaller in proportion, that it was evidently an immature specimen he had before him. The drawings and descriptions were taken from specimens in the famous "Hope Collection" made by the Rev. Fredrick Thomas Hope, containing many types of Australian insects, and now part of the Zoological Museum of the University of Oxford.

Gray says that Allen Cunningham collected and brought to England most of the Phasmids he figured, and informed him that they were found on sapling gum trees in the neighbourhood of Sydney.

This Phasma was figured and described in an article contributed to the *Agricultural Gazette* of New South Wales in 1905 "Sticks and Leaf Insects," and the drawings are reproduced in *Australian Insects.*

The spiny green Phasmids are not only variable in general colouration according to the tint of the foliage upon which they rest, ranging from dark green to deep yellow, but the body and legs are often curiously mottled with patches of creamy white, grey, and brown in imitation of the patches of moss and lichen upon the surrounding leaves and twigs, the arcuations and spines upon the body and legs, representing the thorns and serrations of the leaves of the shrubs of the coastal scrub.

Under ordinary conditions they rest among the foliage during the day, feeding at night, but when disturbed despite the swollen body and ungainly shape they can move about quickly, but when frightened have a quaint habit of resting upon the lower portion of the body and hind legs with the head, thorax and two front pairs of legs raised upward, the conical head pointed at the apex with beady eyes looking as if it was turned upside down. Remaining often for a long time without a movement she looks remarkably like some weird Chinese carving.

This Phasma has an extended range along the coast of New South Wales from near Sydney to the Tweed River, sheltering in the semi-tropical brushes, and most of the specimens obtained in the orchards where they are not in harmony with their surroundings have casually wandered out of the adjacent forest.

In the first three months of the year they drop their hard seed-shaped oval eggs which fall on the ground and evidently remain for some months before the young phasmid hatches out. The eggs, oval in shape, measure 5 mm. in length and are brown with a curious stripe of creamy white down one side, the apex fitted with a saucer-like lid in the centre of which is a conical cork-like plug which the baby phasma pushes out on emerging. Each adult female is capable of laying about 300 of these eggs during the season.

The more slender bodied male is furnished with large well developed hind wings mottled with brownish bands, and can fly well, but can be easily identified by the typical conical pointed spiny head and modified spines and flanges on the legs and sides of the abdomenal segments. The male probably lives in the tops of the trees and is a comparatively rare insect. I have never seen one alive, and the two specimens in the Departmental collections are thirty years old.

In response to my request for information as to the range of this insect outside New South Wales, Mr. Kershaw, Curator of the National Museum, Melbourne, informs me that they have no record of it being found in Victoria. The specimens in the National Museum come from the Clarence River, N.S.W. Mr. Heber Longman, Curator of the Queensland Museum, gives a list of localities from Brisbane, inland to Toowoomba and Killarney, and northward to Cairns. In the Macleay Museum collections there is one from New Guinea, five from Cairns, others from the Northern Rivers, to Kiama, the most southern record.

NOTES AND COMMENTS.

AN INTERESTING SCALE INSECT.—At the June meeting Mr. Froggatt had the following interesting exhibits:—A Lecanid scale insect (*Cryptes baccatum*) so thickly infesting the twigs of the Myall (*Acacia pendula*) on Quanda Station, Gular, that the owner, Mr. George Ryder, states that well grown trees are dying apparently from this scale infestation. He writes: "I have been about here some 40 years and never noticed them on the Myall trees before. Some of the trees are already dead, and a great many attacked. There are some hundreds of Myall trees here that we have been conserving for many years for fodder in drought time, like the present, for the sheep. Evidently they are doomed to destruction. We have been flogging the leaves off the trees with a wire whip, so as not to kill them, if all the branches are lopped off the Myall tree dies." He also says: "In this neighbourhood there are thousands of dead Myall and Yarrani trees that have evidently been killed about the same time, a century ago, probably. I was under the impression that perhaps they had met their fate in some unusually severe drought in the past, such as the whites had no idea of, but since discovering this pest I am inclined to think that this or some similar pest was the cause of their destruction."

Cryptes buccatum infests many different species of Acacias and has a very wide range over New South Wales, both in the coastal districts and far inland. Mr. Froggatt also exhibited a series of specimens of a fine Hepialid Moth, *Pielus hyalinatus*, showing its variable markings, different shades of colour from buff to yellow, light brown and pink. The naked larvae feeds upon the roots of wattles and gum trees, and pupates in a stout yellow skin, when ready to emerge it forces its way up through the surface of the soil, exposing about a third of its length, leaving the skin sticking out of the ground when the moth emerges. This last year these moths have been remarkable for their abundance in all parts of the State, at Borenore Caves I saw scores of the pupal cases sticking out of the ground in May. At Moree half a dozen flew into a lamp in one of the shops, on the creek banks there were many pupal cases, from Deniliquin they were reported to be very plentiful about the same time, and at the Cordeaux River Dam my daughter caught a number attracted to the arc light on the works. The caterpillar of this moth is very often the involuntary host of the curious bull-rush fungus *Cordiceps* that turns the infested caterpillar into a hard, woody substance, with a fruiting stalk like a little bull-rush growing upward from the body.

CENTRAL AUSTRALIA.—Mr. David G. Stead mentioned at meeting, 3rd August, 1920, that he had recently spent some time in Central (Southern) Australia in the vicinity of Ooldea. This locality had been made of the first importance to Australians because of the existence of water in an otherwise vast waterless region at the so-called Ooldea Soak. Here water was obtained by seepage and was pumped to the trans-continental railway line, both for human consumption and for engines. This soak had been known to the aborgines of Australia for ages, and had been a great meeting place. Ooldea is just on the borderland where the sand-hills meet the mighty Nullarbor Plain.

Mr. Stead exhibited the fruits of a small Mallee, *Eucalyptus pyriformis,* which are extraordinarily large—measuring up to two and a half inches in diameter—and of a very ornamental shape. He also showed the fossil "cast" of a univalve taken from a great fossil bed at the edge of the great plain, and a number of flint flakes left by the blacks in the vicinity of the soak.

Erythrina indica. In *Australian Naturalist,* IV., 1921, p. 206, Miss Butler mentions the usual non-setting of seed by this tree in the vicinity of Sydney. That it does occasionally set seed is proved by the exhibition at the July meeting of the Linnean Society of N.S. Wales, by Mr. Fletcher, of a number of complete pods with the seed still attached, from a tree at Hunter's Hill, near Sydney.

Ed. "A.N."

Fulgurites. At a meeting of the Physical Society, London, on April 10th, 1908, an interesting paper was read by Miss Butcher, on "Fulgurites and the formation of artificial Fulgurites." A full report of the paper and discussion which followed its reading will be found in *The Chemical News,* Vol. 97, 1908, p. 225. This can be seen at the Library of the Royal Society, Elizabeth Street.

Ed. "A.N."

Native blackthorn. Mr. T. Steel exhibited specimens of *Bursaria spinosa* from Pennant Hills, heavily infested with the common citrus wax scale. In many cases plants have been killed outright by the scale, which were closely clustered along the branchlets like beads on a cord. As this plant is extremely common throughout the Cumberland fruit-growing districts, it serves as a source of infection to the citrus orchards and should on this account be declared a noxious weed and its destruction made compulsory.

GLIMPSES OF EVOLUTION.

Summary of Dr. W. K. Gregory's Lecture.

In a clear and instructive discourse, illustrated by numerous well-chosen lantern slides, Dr. Gregory unfolded the facts of evolution, showing how in geological time one after another of the great orders of vertebrate animals came into being.

Beginning with the fishes it was demonstrated how the fish gradually adapted itself for life on land, legs and feet being evolved from fins and the amphibia so being produced. The present day climbing fish (*Periopthalmes Kohlrenthera*) being an excellent example of a fish in process of transformation. From amphibian to reptile was an easy step, and then as an offshoot birds arose, the early toothed birds being first; in fact, being modified flying lizards. In due course, through many stages and through unthinkable lapses of time, arose the mammalia. A very striking slide showed in a series parallel vertical sections a lagoon with large reptiles and other creatures, being gradually filled up by erosion from the land and the steady lowering of the latter and widening of the water-course as erosion proceeded, the successive denisons of the lagoon being illustrated as perishing and being covered up by detritus and so preserved as fossils. A series of most interesting slides illustrated the method of excavating the remains of large animals and how the fragile bones are bound up and strengthened with plaster of Paris as excavation proceeds. The subsequent cleaning and setting up in the museum were also illustrated, the explanations of the lecturer making everything clear.

The lecture was an intellectual treat of a high order, and was greatly appreciated by the large attendance of members.

Editor.

BOTANIC
and
NATIONAL HERB

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

ORDINARY MEETINGS.

September 6th, 1921. Mr. A. A. Hamilton in the chair and 31 members present. The Hon. Secretary reported that the President, Miss A. Brewster was unable to be present owing to the sad loss of her brother. It was resolved that a letter conveying the sympathy of the members be sent to Miss Brewster.

Messrs. Cotrell-Dormer and J. W. Marjason were elected members.

A lecture on "Changing Plant Names" was delivered by Mr. E. Cheel.

Archdeacon Haviland sent from Coonamble an abnormal flower of the Common Marigold (*calendula officinalis*) and a specimen of *Verbena officinalis* with slightly larger flowers than normal. Mr. D. G. Stead sent a live *Pandanus* grown from seed collected in 1920 at Trial Bay. Mr. A. C. Duckworth exhibited with notes a lizard (*Pygopus lepidopus*) and a snake (*Denisonia signata*) alive. Mr. L. Gallard interesting parasitic wasps and tape worms. Miss Sulman specimens of *Acacia* from Stanthorpe, Queensland. Mr. E. Cheel "Kephir grains" used in the fermentation of milk.

October 4th, 1921. The President, Miss A. Brewster in the chair. The Hon. Secretary read two letters from His Excellency the Governor stating that he would be pleased to preside at the lecture by Mr. A. J. Campbell on "Wattle Time," but that important business had intervened and precluded his being present. Misses Bamberger, Deighton, Black, West, Saunders and E. Sigal were elected members. Mr. A. J. Campbell, of Melbourne, delivered an illustrated lecture, "Wattle Time or 'Yellow-Haired September,'" treating chiefly of the aesthetic and sentimental aspects of the wattle.

Mr. E. Cheel exhibited a series of beautifully mounted, named specimens of 50 species of *Acacia* from the National Herbarium, and gave descriptive remarks on the characters of some of the more notable species mentioned by Mr. Campbell.

Mr. A. Forster, a very fine series of water-colour drawings of epiphytal and terrestrial orchids, which were much admired. The President, a transverse section of a phyllode of *Acacia suaveolens,* and explained its structure, showing palisade cells all round the phyllode, and with narrow intercullular spaces, the large midrib and the edges of the phyllode being protected by thickened cells called "stone" cells. This constitutes the xerophytic type. Other types illustrated have colourless spongy tissue with larger spaces between the cells.

Mr. Neville Caley, State representative of the Royal Australasian Ornithologists' Union, gave an invitation on behalf of the Council of the above to members of the Naturalists' Society to attend the Annual Congress of the above Union, to be held in the King's Hall, Hunter Street, on October 6th. An invitation was also extended to members to a lecture on "The Economic Value of Our Birds," to be given by Capt. S. A. White, of South Australia, in the Lecture Hall, Australian Museum, College Street, on October 7th.

"CROSSLANDS."

By D. W. C. Shiress ("Weroona.")

I wonder how many readers of the *Australian Naturalist* know of the beauties of the Hornsby District. Very few of the residents are even aware that within easy walking distance one can get scenery, if not on so grand a scale as the Blue Mountains, yet grand enough, and beautiful with glimpses of inlet and creeks,—scenery which keeps ones thoughts lingering after it, even on a blistering summer day.

Why "Crosslands" and where is it? Someone has heard that in the dark ages a family of that name lived on Berowra Creek, and the name dwells, and the remnants of what must have been a well constructed road will eventually fade away into oblivion. However, my friend, who by the way has the "Loranth" Fever badly, once on a summer's day, when ones thoughts could conjure nothing in the way of beauty but an iceberg, suggested we should follow a road we had several times crossed, and investigate, well knowing I should grumble at being dragged out to tramp along the Galston Road with the temperature close on to the century. So it was that we located Crosslands, and that on a sultry day in January I caught the train to Hornsby, with a mind full of misgivings and "I-told-you-so" spitefulness rampant.

How soon one gets over his pettishness under the touch of Nature's hands, and despite heat and flies, ones mind swings round by simple gradations and you look with a lover's eye on the gullies you know so well, and it is here on your left is *Melaleuca Deanii,* and close handy down that gully is Cheel's Bottle Brush *Callistemon acuminatus,* and there is *Daviesia latifolia,* which we lost sight of in the flowering season, and over to the right on the next ridge, Mt. Colah Road, is *Acacia stricta* and so on, until you reach the turn off—now well marked —for some well meaning folk have marked the spot by dumping a Returned Soldier on to an impossibility, and built him a cottage thereon to count his chicks.

The road is used by wood-getters, and for a bit is uninteresting. Some fine old scribbly gums (*E. haemostoma*) remain, but the country is the same old Hawkesbury sandstone, which you can see with your eyes shut, and for a couple of miles the only item of interest appears in a young Butcher Bird, which, with the confidence born of youth, permits us to approach close enough to examine without the aid of field glasses, whilst its parents utter dismal cries from the depths of a gully, and three crows hover round, doubtless croaking sound advice to the youngster. However, as we could not minister to its wants, we proceed, and soon are in "terra incognita" and the road becomes interesting as it follows a narrow ridge with Connolly's Creek on the right and some very broken country on the left. Connolly's Creek rises at the back of Asquith Station, and is the most interesting part of the district.

The gum trees from here include *Eucalyptus resinifera* and *E. punctata,* the former known as Red Mahogany, and the latter as Red Gum. Acacias are almost absent, *A. hispidulus* being the only one we meet with. *Pultenea Deanii* abounds, and a strange Casuarina *distyla*—a hungry looking tree.

Looking towards Kuringai—the station being visible—the small leaved form of the Scribbly gum (*Haemastoma micrantha*) catches your eye. Its bark show out in stripes of pale blue of an exquisite tone, and *Angophora lanceolatus* also in full glory of new bark, appeared as if blushing at its nakedness and lending a touch of color to the depths below.

The road from here has been well built, the stone facings suggest convict labour, and as we descend we discuss the question—and wonder.

Passing through a natural avenue of "She Oaks" (*casuarina torrulosa*) we are tempted to leave the road and go straight on to the point where Connolly's Creek joins Berowra, and afterwards regret our action, as the cliff is difficult to negotiate. The rocks are a mass of Rock Lilies, also that pretty clinging orchid *Dendrobium linqueforme,* and the view is one that repays you for the hot walk and brings peace to your soul.

Trachymene Clelandi is found in quantity growing round the water's edge but *Bursaria spinosa* has possession of the point, and you are not at all sorry to come across a wallaby track, and so escape with some of your skin intact.

Notwithstanding the heavy rains of the previous week, we had difficulty in finding water for the billy, and it was whilst searching about for it that the unexpected happened in the shape of a Lyre Bird. He was making a great fuss in the scrub, but experience had taught us how difficult it was to stalk him, and so as the *Bursaria* was thick and water was our quest, we just scrambled through and almost on top of Mrs. Lyre Bird scratching for food. She took not the slightest notice of us, and as we waited developments the Lyre himself favoured us with an imitation of the Coach Whip Bird's call, while we wondered where he could be. As he started the Thrush's song we located him on a branch about 10 feet above Mrs. Lyre, whereon he hopped to the ground and started to show off, raising his tail and strutting around "a la Peacock." Keeping the tail erect requires great muscular exertion, so we judged, as the quivering of the feathers made it appear as if it were an effort for the bird to show it off to perfection.

It was an experience we had often wished for, but never expected to stumble on to. We camped within 20 feet of the birds, and they took no notice of us, whilst the billy boiled. This and the finding of a gnarled *Angophora intermedia* made us wish we had a camera with us. This tree is well worth a visit, and as it is handy to the road cannot easily be passed by. *Eriochloa Maideni,* a Panicum-like grass of a semi-climbing habit, was plentiful where we lunched.

The Creek, or rather inlet, is characteristic of the Hawkesbury, the erosions from the hills and gullies forming spits of arable land, and it was on one of these level stretches on the opposite bank that the old "Crosslands" house stood. The banks had been faced with stone, and had the appearance of an old ferry crossing. Some beautiful trees of *Phyllanthus Ferdinandi,* also worth a visit, gave shelter to a carpet of variegated maiden hairfern, in which we luxuriated before climbing the road up to the ridge.

Notothixos subaureus, a parasite of the Loranthus, was very plentiful on the Ironbarks (*E. paniculata*) and showed up a mass of golden green amongst the darker foliage of the trees.

My "Loranth" friend found it parasite on itself, which so delighted him that he ascended the zig-zag road ahead of me, oblivious to the St. Andrew's cross spiders, which had festooned the road with their strong webs, and making a track through these horrors for which I was peculiarly grateful.

At the bend of the road you have a fine view of the Creek as it winds away to the East. A zig-zag road is visible on the opposite cliffs, and evidently connects with the Wiseman's Ferry Road, and this road should be worth a visit from the evidence of mountain forms of plants we have from time to time secured in the vicinity.

The Hawkesbury is fed from the Southern Tablelands, Blue Mountains, and the hills at the back of Gosford, and its gullies, sometimes ravines, are well worth exploring, apart from their natural beauties.

An old stone mile post at the last lap of the ascent shows 20 miles, i.e., six to Hornsby, and with four hours to use up we "daunder" home, well satisfied with our trip and admit that the Hawkesbury sandstone has still some attractions, even on a hot summer's day.

EXCURSION TO GALLIPOLI STAIRS, MIDDLE HARBOUR, MAY 7th, 1921.

A large number of members and friends were present. Miss Le Plastrier being unfortunately unable to attend, Mr. A. A. Hamilton acted as leader, and our thanks are due to him for a successful afternoon, and for naming the plants collected. Growing underneath the stairs were many young plants of *Pteris incisa,* while at the top a variety of specimens were collected, including *Phyllanthus, Lasiopetalum ferrugineum, Hibbertia Billardieri, Juncus, Eriostemon Crowei, Phebalium squamulosum, Scaevola hispida, Trachymene linearis, Baeckea crenulata, Styphelia microphylla, Acacia myrtifolia, A. juniperina, Grevillea punicea, G. buxifolia, Cryptandra ericifolia, Cassinia denticulata, Angophora cordifolia, Calycothrix, Bossiaea heterophylla, Hemigenia purpurea, Philotheca, Bauera rubiodes.* The specimens of *Bossiaea heterophylla* at this spot had very poor flowers and small leaves, further on the same species was collected, having larger flowers and more healthy looking leaves, while further on again the flowers and foliage had attained their true characters. Doubtless this has an interesting ecological significance. *Hemigenia purpurea,* was growing in abundance in this locality, and one plant, collected by Miss Rose Winter, had the flowers white instead of the usual heliotrope. *Angophora cordifolia* and a small piece of *Philotheca* in blossom were collected, both being out of season. *Halorrhagis* and Pultenaea which had attained a considerable height were seen, but these were not in flower.

Quite a number of plants infested with "Witches' broom" were noticed, particularly one of *Leptospermum.* The parasite causes the tips of the branches and ultimately the whole plant to die. As the leaves wither and turn to a pretty dull red, they are sometimes collected by small boys and sold as rarities to unsuspecting admirers. A variety of plants in this district are attacked and the parasite appears to be gaining quite a hold. *Pteris incisa* and *Lindsaya linearis* constituted the fern growth. The locality does not offer itself as a favourable habitat for the majority of ferns, but the Australian "peat moss," *Salaginella uliginosa,* had found a situation in which to produce a prolific growth. The moist weather of the previous week had brought on many fungi, and a number of *Agaricus, Boletus* and *Polyporus* were obtained. A patch of tiny orchids, *Eriochilus autumnalis* was noticed. The flowers resemble those of *Caladenia alba,* but the distinction lies in the leaves, which in the latter species are pear-shaped, and quite different to the linear leaves of the former.

Good collections were also made by the entomologists.

THISTLE HARRIS.

NOTES AND COMMENTS.

GYMNODACTYLUS PLATURUS. Two Geckos, each showing a different stage in the growth of a "second" tail. As often happens with Geckos, the original tail had been thrown off or knocked off. The larger (and older) of the two Geckos had a very "young" tail—little more than a knob; while the smaller Gecko had a much larger tail which had not, however, yet attained the size of the original. The difference in skin texture between an original and "second" tail was mentioned, i.e., the "second" tail does not develop the characteristic spines and therefore is a softer and more flabby appendage than the original tail. Dotted here and there on the skin of the Geckos exhibited little red mites could be seen; only very close examination proved them to be mites, superficially they appeared to be red tubercles of the skin.

ROSE M. WINTER.

THE AXOLOTL. Those who have had the pleasure of visiting Mr. Finck's aquarium will remember that interesting creature the axolotl, the tadpole or so-called larval stage of the Salamander (*Ablystoma tigrinum*), which possesses gills, and for some unknown reason breeds in this stage, though it ultimately loses the gills and passes into the gill-less mature state.

At the Soiree of the Royal Society of London in May of last year, it was shown that when brought under the influence of ox thyroid gland extract, the change takes place with great rapidity, the stimulating effect of the thyroid extract precipitating the transformation.

This result was aptly expressed by a well-known British chemist, as follows:—

"Oh, come with me and you shall see
  The Axolotl gay,
He's only here three weeks or so,
  He hasn't come to stay;
He'll be a salamander soon
  Disporting in the warm lagoon,
A snack of thyroid does the trick,
  Research has found a way!"

Ed.

Parasitic Wasps.—At the September meeting, Mr. L. Gallard exhibited two species of parasitic wasps, one introduced, the other indigenous, which had apparently so reduced the Brown Olive Scale (*Lecanium oleae*) that, whereas ten or twelve years ago it was a serious pest now it has to be sought for in a number of our coastal districts.

Banded Hover Fly.—Mr. Gallard also exhibited young orange twigs, on which studded amongst orange aphis were the small white elongate eggs of this Syrphus Fly. In his experience when these appear early it may be taken as an indication that there will be little trouble with the Peach Aphis. The eggs hatch out tiny larvae, which feed so ravenously on the aphis, that, when they get an early start they almost clean it up before it gets a chance to spread to any extent. Lady birds come along later and do good work, but their weakness is that they do not appear until the aphis has done most of its damage.

Tape Worms.—Other exhibits were tape worms from the gall-bladder of a wallaby, and from between the skin and flesh of a diamond snake.

STUDIES IN FOLIAR PERIODICITY.

By Edwin Cheel.

The monthly excursions held on July 9th and August 6th respectively, were conducted for the purpose of studying the leaf-fall and foliar renewal of certain native as well as some exotic shrubs and trees in the Outer Domain and Botanic Gardens, and Hyde and Cook Parks. This matter has engaged the attention of the writer of these notes since 1916, when it was noticed that an English Oak Tree (*Quercus robur* var *pedunculata*) in the Outer Domain, quite near the main entrance to the Botanic Gardens, Sydney, had commenced to unfold or renew its leaves on the 28th of August, whilst other trees of the same species showed no signs of leaf renewal.

In following the matter up more closely, a group of eight trees of the same species were observed growing equal distances apart, along the foot-path in Hyde Park, from St. Mary's Cathedral to Market Street. Although the individual trees belong to the same species, and are in an open position, receiving light from all directions, that is to say there are no trees surrounding them to rob them of light, it is very noticeable that the leafbuds of the second tree on northern side of the path commence to expand fully a month earlier than the other individuals of the same species.

In the Outer Domain there are four trees of *Ficus infectoria* (*F. Cunninghamii* of Australian Botanists) which became completely defoliated once a year. The leafless stage lasts only about a month, namely in July, when foliar renewal begins again early in August. The large tree of the latter species near the main entrance to the Botanic Gardens (not far from the Art Gallery) is slightly in advance of the other trees of the same species, as the buds on the tips of the branches or branchlets are distinctly green on the 6th of August, whereas those of the other trees are not visible until a week or so later. Early in September the leaf-buds are sufficiently advanced to give the whole tree a distinctly green appearance, and when studied in conjunction with the two individual trees of Oaks previously referred to, they may be taken as the harbingers of Spring in the Parks and Domains of Sydney.

Another species of Australian tree worthy of special note in connection with the question of foliar periodicity is *Ficus Henneana*. The trees of this species commence to become defoliated about August 10th, and although they are not so markedly deciduous as those of *F. infectoria*, it is particularly interesting to note how rapidly the apparently fresh shiny green leaves fall, and in less than a fortnight after the leaves have fallen, the leaf-buds commence to expand and the whole tree is a beautiful sight of new leaves in about a month after the old ones have fallen.

Some shrubs of our so-called "Native Laurel" or "Mock Orange" (*Pittosporum undulatum*) were examined on July 9th, when it was found that the leaf-buds were at this early date commencing to expand, and when examined a month later, namely, August 6th, the young leaves were unfolded and new growth of stem up to an inch in length had actually been made during the interval of a month. A few shrubs in sheltered positions in the neighbourhood of Croydon of rather old or fully matured plants had actually produced young flower-buds quite visible to the naked eye.

We may look upon *Pittosporum undulatum* as probably the earliest of our native plants to produce its new leaves and flowers among those cultivated as ornamental plants. The latter is an evergreen shrub and although the young leaves and flowers are very noticeable during July and August, I have not yet noticed the period in which the plants become defoliated as in the two species of *Ficus* previously mentioned.

In the Southern parts of Great Britain, the catkin of a species of *Salix* growing along the sides of running streams, together with the cultivated or "Common Larch," trees (*Larix europea*), are among the earliest plants to show that Spring weather is approaching. It is interesting to note that in our Sydney Botanic Gardens the "Virginian Swamp Cypress" (*Taxodium distichum*) is one of the earliest harbingers of Spring in this part of the Southern hemisphere. There are quite a number of plants in addition to the above that are well worthy of special study on similar lines.

KEPHIR GRAINS.

By Edwin Cheel.

At the September meeting, specimens of "Kephir Grains" were exhibited, which were received from Miss Evans, of Canowindra, under the name of "Milk Plant." In general appearance they somewhat resemble the "Ginger Beer Plant," which was shown at the July (1920) meeting of this Society, but differ in certain respects, as it has been found that whilst the "Ginger Beer Plant," belonging to a class of symbiotic ferments in which a yeast and a bacterium live together, and which excites fermentation in sweet solutions, setting free carbonic acid gas, the "Kephir Grains" are incapable of fermenting saccharose, maltose, glucose or fructose, but on the other hand are capable of splitting up lactose, hence it is used in the fermentation of cow's milk. In a work entitled "Bacteria and Their Products," by G. S. Woodhead, p. 12 (1892), the following interesting particulars are given in connection with the latter:—

"In 1882, Kern described the peculiar ferment known as kephir grains, by means of which the Caucasians set up a double alcoholic and acid fermentation in milk. These kephir grains, says De-Bary, in the fresh living state are "white bodies, usually of irregular roundish form, equal to or exceeding a walnut in size. They have their surface roughened with blunted projections and furrowed like a cauliflower; they are of a firm, tough, gelatinous consistence, becoming gradually cartilaginous, and are of a yellow colour when dried; they are chiefly composed of a rod-shaped bacterium, many of these being united to form long threads, arranged in a kind of felt or network, the meshes of which are filled with a tough gelatinous membrane which binds the organisms together into a kind of zoogloea mass. This rod shaped organism is known as *Dispora caucasia* as at the end of each rod is a rounded spore. Along with these may usually be found a small proportion of a yeast-like fungus which, however, is merely entangled in the gelatinous mass, although it certainly undergoes development by sprouting.

There is also present the ordinary *Bacterium lactis* which with a number of other impurities adheres to the kephir grains; this also occurs in the milk itself.

To prepare the specially fermented milk, one volume of these kephir grains is moistened and added to about six or seven volumes of fresh milk, the whole is protected from dust, but is exposed to the air for about twenty-four hours at the ordinary temperature of the room, and is frequently shaken; the milk is then poured off and a fresh quantity added; the milk that is poured off is mixed with double its quantity of fresh milk, put into bottles, well corked, and frequently shaken.

This bottled sour milk soon becomes sparkling and effervescent, and is ready for use after it has been bottled for a day or two. It then contains lactic acid, a considerable quantity of carbonic acid, which varies according to the temperature and the duration of the fermentation, but is sometimes sufficient to burst the bottle or drive out the corks.

The liquid contains about one per cent. of alcohol."

LIFE HISTORY OF GONIOZUS ANTIPODUM.

By L. Gallard.

On examining some bandages taken from quince trees at Eastwood on March, 1921, I noticed a clump of small yellow oblong larvae in a place where a Peach Tip Moth larva had been spun up. On examination they were found to be the larvae of a small wasp, while in another cocoon, which had torn open, was a row of seven of these tiny creatures with their heads buried into a Peach Tip grub, which they had almost sucked to a skin. A little later I found the adult wasp right in the inside of a cocoon. On examining the grub I found three fresh laid oblong glassy eggs, and two tiny little larvae sticking to it. A further search in the same bandage revealed another adult. I submitted the adult to Mr. Froggatt, and he has kindly identified it as *Goniozus antipodum.* This is a small black antlike wasp, with a pointed abdomen and plain wings. It is not an internal parasite. The young larvae. when hatched, attach themselves to the host, and there hang until they have sucked it dry. By this time they are ready to pupate. They then spin a small white loose cocoon around themselves, and await their change. I secured a photo of a group of four, which had attached themselves to a Peach Tip grub. A copy of this, and a tube showing the full life history of the wasp, from egg to adult, I am placing on the table tonight for inspection. The specimens in the tube are all alive. This tiny little friend should be welcomed heartily by every one who grows a Peach tree.

NOTES ON PORISMUS STRIGATUS.

By L. Gallard.

On March 3rd on examining a jar in which I had put away a larva of *Porismus strigatus* the dark painted winged Osmylid on October 10, 1920, I noticed the nymphe form had just crawled out of the cocoon. In about ten minutes the pupal skin burst at the thorax, and the adult began its struggle for freedom. By a series of pulsations it forced it way out. This took about 20 minutes. The head was doubled in under the thorax, and it seemed to be having a hard struggle to draw the long antennae free. When at last it succeeded the antennae and anal segment liberated themselves almost simultaneously. The insect then crawled up a piece of rag and began to force the air through the trachae of the wings. Another 15 minutes passed before the wings were fully expanded.

THE IRREGULAR APPEARANCE OF CICADAS IN NEW SOUTH WALES, SEASON 1920-1.

W. W. FROGGATT.

In ordinary seasons the large cicadas emerge, and are to be heard in the vicinity of Sydney about the 9th of November, continuing their music until early February. This year their appearance has been very erratic, and the few that have appeared have remained long after their usual time. There has also been a marked absence of the larger species, usually so numerous about our parks and gardens, and on the coastal forest trees. There were a few "Green Mondays" (*Cyclochila australasiae*) about the streets of Croydon for about a week in the early part of December. Mr. McCarthy informs me that at Mortlake the same species appeared in small numbers for a short time about the same date. In the Hawkesbury sandstone country the "Double Drummer" (*Thopha saccata*), "Union Jack" (*Macrotristria angularis*), "Black Cicadia" (*Psaltoda moerens*) and the "Washerwoman" (*Henicopsaltria eydouxi*) have been absent altogether from their usual haunts, and only odd specimens have been recorded. Even the small black squeakers (*Melampsalta*) have not been much in evidence.

On 28th February I noted quite a number calling at midday in the Outer Domain up a large water gum, but could not locate the individuals, though the note was like that of the "Green Monday" in a subdued key.

A lady member of our Society informed me, after the meeting, that about 27th February she saw and heard a number of this species in a tree at Petersham.

In the country, however, the reverse has been the case, and one species has been abundant in localities where it is seldom noticed. At Warrah, in sandy country covered with pine scrub and small gum trees the noise made by an undetermined species (the Black Cicadia, I think) was almost deafening in December. At Dubbo, on the banks of the Macquarie, on February 8th, and on the white gums in the bush, *P. moerens* was very abundant and noisy. The residents in both localities informed me that these insects are rare, and seldom noticed in other years.

SOME OBSERVATIONS ON THE EUCALYPTS OF THE PORT JACKSON DISTRICT.

By D. W. C. Shiress.

As a prelude to my remarks, I would like to express my appreciation of "The Critical Revision of the Eucalypts." This great national work reveals the stupendous task undertaken and so successfully carried out by its author, wherein he has given to the world so much of the known literature on the subject, arranged under each species, that to those who follow in his footsteps a blazed trail is prepared, and is there anyone who would not gratefully acknowledge this, and not only this, but the personal observations which reveal the life work of a master?

In delving into this work and noting the frequent use of the term "Hybrid" by the different authors he quotes, I conceived the idea of noting the flowering periods of such species as came under my own observation, with the hope that it might prove of assistance and throw some light on the supposed hybridisation of some of the doubtful species, and so, as my range as well as time is limited, I have decided to appeal to the members of the Society for assistance, more particularly to the country members to note the flowering periods of the eucalypts in the districts wherein they are situated, and if any have doubts as to the species, to send flowering specimens with fruit to me and I will have them named and record the date and name of the sender.

In the course of my wanderings in French's Forest and Kuringai Chase, probably it was by having the above definite object in view that the differences which I will mention were brought so particularly under my notice, differences which show how great a part environment plays in the life of the trees in their struggle to overcome unnatural conditions, and also in the evolution of species.

Haemastoma, otherwise known as "Scribbly Gum," one of the most common about the district, is, in the sandstone, a robust though weird looking tree—yet when found in the shale or even better class of sandstone country, we can understand Von Muller's notes "that it attains a considerable size and furnishes timber for fencing, etc."

Now you must all know, i.e., if you have done any walking about the district, that patches of sour country occur so frequently that they form a regular feature of the bush. Sometimes these patches are mere marshes, but are more often covered with thickets of *E. haemastoma* rarely more than 10 feet in height and grouped together mallee fashion, adapting themselves to altered conditions and maybe forming a stable variety of this species. *E. haemastoma var micrantha,* although in some parts quite as plentiful as "haemastoma" itself, I have never found in the stunted form or growing in clumps.

As with the Scribbly Gum so with *E. eugeniodes* which is to be found growing everywhere it can obtain a footing, one of the progressive species that give one some idea of the difficulties with which the author of "The Critical Revision" has had to contend, for it is to be found in thickets very mallee-like in appearance and up to 7 feet in height. You find it on one side of a track with narrow leaves, and small narrow suckers—on the other side, typical—and then to your confusion you discover that some of the trees have "sessile" fruits. Yet who is to say they are not all *eugeniodes* breaking up into groups and forming types to overcome their environment. Unlike *E. corymbosa, punctata, umbra* and other trees to be found in the district—*eugeniodes* does not flower simultaneously—for you rarely find more than a couple of trees in flower at the same time.

E. corymbosa is to be seen on the heights above Flat Rock, Middle Harbour, in conjunction with *Angophora bakeri* with very narrow leaves and small elongated fruits, while just off the Spit-Pittwater Road near the 9 mile post is growing in conjunction with a patch of *E. virgata*—about 4 feet in height, and when I last saw the patch it was covered with full sized fruits, and showing to my mind that it has overcome its difficulties, and is able to reproduce itself. This form can be frequently met with right to the Hawkesbury.

With regard to the narrow leaved variety found with *Angophora bakeri* and hardly distinguisable from it from a distance, can this be the result of association? As a matter of fact in such a species as this so frequently met with, one must expect a series of variations, and I ask the question for the reason that I have noticed waratahs growing with banksias and the similarity in the leaves was so marked that I had to satisfy myself that the plants were really waratahs and not banksias.

E. punctata is to be seen in three distinct forms—on the wind swept heights of French's Forest, more to the Manly side, may be seen a broad leaved stunted form, with very large fruits and large suckers and leaves, its depauperate appearance being doubtless due to the strong sea winds which sweep the heights.

Around Hornsby you find what is known as the typical with broad suckers and also a narrow leaved form with very narrow suckers and leaves.

E. pilularis, our most useful and consequently most rapidly disappearing tree, is to be seen in St. Leonards Park as a stringy bark. It is also found in Kuringai Chase on the tops of the ridges with stringy bark, whilst in the gullies it has the "blackbutt" and clean bole which gave it its name, the stringy bark evidently being an adaption against the weather or bush fires.

E. sieberiana is another tree which is to be found in poor soil adopting the gregarious habit. It frequently throws a dozen or more long tough poles from a base—poles which supply most of the clothes props hawked around the suburbs. I have searched for a stump in several of these clumps thinking that maybe a tree had been cut down and the suckers resulted therefrom, but this is not so, and it grows in rough stony flats, and I have found it both in flower and fruit.

E. squamosa, found from the Hawkesbury up to Kuringai, I mention for the reason that it appears to be in bud all the year round. I got it in flower, i.e., to say a few trees had a few flowers on, in October last year, but this year there was no sign of the buds opening. I am inclined to the opinion that it probably flowers every second year, but this has to be determined, and I shall be glad of any notes by any of the members on this particular species. The trouble is, one cannot live under the trees.

It is very interesting to note the peculiar habits of the trees—*E. umbra* for instance being found alongside the water at the Hawkesbury, and only on the ridges that are under the direct influence of the sea breezes. It ascends as far as Cowan Stations and ends abruptly, only to be found again on the heights overlooking Manly.

E. eximia appears to confine itself to the ridges from the Hawkesbury along Berowra Creek proper, and it extends only to the Galston Road, about 3 miles from Hornsby.

E. virgata is to be found only on the south east side of the hills rarely going beyond a couple of hundred feet down the side. It is a most conservative plant, and so not often met with.

E. capitellata like *robusta* appears to prefer the sea, and does not extend beyond the influence of the sea air.

The ironbarks are only to be found in the shale, consequently are not often met with.

It must be understood that I am writing solely of a particular district—the sandstone country embraced by French's Forest and Kuringai Chase, the shale country being comprised in the ridge up the North Shore line to Asquith and patches on Berowra Creek, a district that has taken me nearly 3 years to work systematically. There is a lot yet to be accomplished from Hornsby right across to Parramatta, and I appeal to members to assist and note the flowering periods of such species as *acmeniodes, etc.,* to be found there.

There is work for all on the eucalypts, more particularly for those interested in the pollination of the flowers.

This is a subject which will throw considerable light on supposed natural hybridisation, for it is my opinion that the eucalypt flower does not lend itself to outside pollination. The arrangement of the stamens seems to guard against any outside influence.

LIST OF FLOWERING PERIODS OF EUCALYPTS.

January.—Pilularis (black butt), punctata (red gum), capitellata, corymbosa, resinifera (mahogany).

February.—Capitellata, eugeniodes, pilularis (stringy bark), corymbosa, saligna, haemastoma var micrantha.

March.—Haemastoma, corymbosa.

April.—Haemostoma, globulus.

May.—Globulus, haemastoma, paniculata, eximia (out of season), eugeniodes var ligustrina (Wentworth Falls), corymbosa (Wentworth Falls).

June.—Punctata (stunted form), virgata, paniculata, crebra, obtusiflora, citriodora, sieberiana, capitellata, eugeniodes var ligustrina (Wentworth Falls), corymbosa (Wentworth Falls).

July.—Sideroxylon, leucoxylon, ovata, paniculata, capitellata.

August.—Eximia, camfieldi, haemastoma var micrantha.

September.—Eximia, umbra, crebra, dives, camfieldi, haemastoma var micrantha.

October.—Dives, viminalis, crebra, squamosa, eximia, umbra, teretecornis, numerosa.

November.—Teretecornis, ficifolia.

December.—Capitellata, ficifolia.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

November 1st, 1921. The President, Miss A. A. Brewster, in the chair, and 19 members present. Misses West and Saunders, and Mr. A. Forster were duly elected members, and Mr. Cotrell-Dormer as a country member.

Mr. D. W. C. Shiress read a most interesting and instructive paper on "The Flowering Periods of Eucalyptus." Appreciative remarks were made by the President, and Mr. Cheel.

The President read notes on "Observations on Birds," and exhibited leaves of waratah and common blackberry cut by the leaf-cutting bee (*Megachile*). These leaves are much tougher and more rough than those previously noted as being utilised by this insect (*A.N.* Vol. IV., p. 136). Mr. Cheel read notes on certain species, and varieties of *Acacia*, and on orchids collected in Centennial Park.

Mr. P. D. Murray read a note on *Pinnotheres*, a parasitic crab.

Miss Winter, a live Gecko, and Mr. Hage, a piece of wood infested with a peculiar beetle.

December 5th. The President, Miss A. A. Brewster, in the chair, and a large attendance present. Miss Haussmann, Mrs. H. J. Preston and Mr. H. Brownski were elected members. Mr. L. Gallard read notes on the grubs of the moth *Zeuzera* and on the eggs of the Green Tree Hopper, and also reported that the cicadas which were so scarce last year were now emerging freely. He had heard the blacks, greens and yellows all singing lustily during the last week between Epping and Ryde.

Miss Saunders, specimens of snapdragon with deformed flowers and sunflowers showing synanthy. Miss le Plastrier, on behalf of Mr. Hennesy, interesting specimens of *Opuntia*, which had sprouted after being a long time removed from the growing plant and apparently dead and dried up. Mr. Cheel "scarlet" and "blue" pimpernel (*Anagallis arvensis* and *A. coerulea*) and read a note thereon.

Mr. T. Steel delivered an interesting lecture entitled:—"Kava and kava drinking." Mr. Steel demonstrated the Fijian native method of preparation from the grated or pounded root, and gave the audience an opportunity of tasting this famous South Sea Island drink.

The Hon. Secretary announced that the Council had decided to hold an exhibition of Wild Flowers and of Insects in September, 1922, provided a suitable hall could be secured.

It was also announced that an Entomological branch of the Royal Zoological Society is being formed. Persons desirous of joining such should communicate with Mr. Goldfinch, Box 2399 G.P.O., Sydney.

February 7th. The President, Miss A. A. Brewster, in the chair, and 35 members present. Misses Beatrice and Bertha Macauley, Winsome Hall, and Mrs. J. Walker-Jones were duly elected members. The Hon. Secretary read a card from Miss May Brown, who is at present in New Zealand, sending fraternal greetings to the members. Miss T. Harris exhibited the Bird's-nest fungus (*Cyathus stercorarinus*) collected at Glenbrook, November, 1921. The President, specimens of *Brunonia australis* from Clarence Siding.

Mr. T. Steel communicated a note on the Mound Ant, and Archdeacon Haviland notes on "Evidences of Insect intelligence." Miss Winter exhibited plants identified by Mr. Cheel as *Eryngium rostrata.*

Mr. Cheel gave an interesting lecture, "Notes on the Weeds of Civilization."

NOTES ON THE "SCARLET" AND "BLUE" PIMPERNEL.

By Edwin Cheel.

Both the "Scarlet" and "Blue" Pimpernels have been found as naturalised aliens in many parts of the State, and we find them recorded as far back as 1867 by Woolls in his *Flora* of Australia, p. 148, under the respective names of *Anagallis arvensis* and *A. coerulea.*

In connection with the "Blue Pimpernel," it is interesting to note that European botanists have abandoned the idea of regarding this as a variety of the "Scarlet Pimpernel" and have taken up Miller's name *Anagallis foemina,* published as far back as 1807 (Miller's Gardener's Dictionary, ed. viii., No. 2).

In referring to the "Blue Pimpernel," Miller states *l.c.*, "Supposed to be only a variety, but from thirty years cultivating it I can affirm it never alters, and the plants before they show their flowers are so different, as to be easily distinguished."

During the past six years I have found the "Blue Pimpernel" even more plentiful in Ashfield than the "Scarlet Pimpernel," and although generally regarded as a variety under the name *A. arvensis* var. *coerulea*, I have noticed that it is easily distinguished by the narrower and longer calyx-lobe, and the petals being distinctly serrated along the edge. It also breeds true from seeds. Both the "Scarlet" and "Blue" Pimpernels are figured by Sowerby in Smith's English Botany on Pl. 529 and 1823 respectively, dated, 1803, but the drawing of the "Blue Pimpernel" is rather poor, and does not show the characters as clearly as they are seen under an ordinary lens. There is, however, a fine coloured drawing of the "Blue Pimpernel" in Hayne's Gewachse on Pl. 46 (1805) which gives a very clear contrast of the details of the flower as well as the colour when compared with the "Scarlet Pimpernel," also figured in the latter work on Pl. 45. As both forms breed true, it seems desirable to regard them as distinct species under the respective names *Anagallis arvensis* and *foemina.* In the Handbook of the Flora of New South Wales, p. 525 (1893) by Moore and Betche, only the one species is recorded, namely, *A. arvensis,* but both forms are recorded by Ewart, Maiden, and even Bailey refers to the blue form without recording specific names.

Professor A. J. Ewart states (Proc. Roy Soc. Victoria, Vol. 27, p. 297, 1914), that *A. arvensis* was responsible for the death of 23 cage birds at an aviary in Mentone, Victoria. The birds were given a few handfuls of chickweed, containing "Pimpernel." Next morning 23 out of about 100 birds were dead.

OBSERVATIONS ON BIRDS AT CLARENCE SIDING.

By Miss A. A. Brewster, F.T.C.

In January, 1921, at Clarence Siding, Blue Mountains. The Spotted Diamond Bird (*Pardalotus punctatus*) was building in the side of a low bank around a garden path. The entrance to the nest was a little under 2 inches in diameter.

The Singing Honey-eater (*Ptilotis sonorus*) had built a nest in a Wistaria vine: it was round and open, and contained two baby birds. Both parent birds aided in feeding the young. Both also sat on the nest, but the male seemed to do so only while the mother got her meals. We noticed too the ease with which the mother settled down on the nest, whereas the male looked less comfortable. We noted that when the male brought food the female just hopped off, and waited until the young were fed, and then resumed her place on the nest.

The birds escorted the fledglings out of the nest at the end of January, and early in February the nest was deserted.

EVIDENCES OF INSECT INTELLIGENCE.

By Archdeacon Haviland.

On a footpath in my garden I watched a fierce battle between a fully grown wasp—(*Exeirus lateritus*)—and a large black spider; the wasp made several dashing attacks with its sting upon the spider with apparently negative results, till, clinging to the spider, stung it with the desired paralysing effect. But the outstretched legs of the spider were greatly impeding progress to the wasp's tunnel. This difficulty caused the wasp to stand back for a while as if in a thinking attitude, then circling around its victim a few times stopped, and walking proudly up to the spider commenced deftly to nip off each leg at the shoulder, leaving the eight amputated limbs in situ on the ground. Having thus solved the problem the wasp easily carried its prize to its tunnel as a host for its larva.

Along another path two large black ants were hesitatingly advancing as though exploring; but one ant scrupulously observed its subordinate position by following up closely at the rear of the other; if by any means the leading ant stopped short and the rear ant by impetus advanced past, it would invariably return to its position. Further, if the leader took an unexpected turn on account of some obstacle, and the rear ant lost its mate by going around the wrong way, the leader would stand still till the other, after an excited search, sometimes far and wide, had succeeded in finding its mate and taken up the rear.

I was interested to see where these ants were going to but turning into the lawn, they were lost from view.

NOTES ON REPTILES.

A. C. Duckworth.

While collecting orchids in the bush at Long Bay, I disturbed a small snake (*Denisonia signata*) which I succeeded in catching. *Denisonia signata* is a slender, venomous snake, 18 inches long, belonging to the Whip Snake family. On each side of the head is a yellow streak about half-an-inch long. The underside of the body is bluish-grey, while the colouration of the back is dark olive green merging into brown; a very active species, capable of flattening its body similar to a Tiger snake (*Notechis scutatus*).

Pygopus lepidopus:—(Snake Lizard). When caught, made a squeaking or whistling noise, resembling that made by a young bird. The lizards vary in colour, one being a slatey-grey, and the other a rusty brown, with pink, yellow and grey spots on the belly, and which on close examination show the skin to be very prettily marked. In captivity it will eat small insects, such as wood-lice, snails, slugs, flies. It will also drink milk. When handling it, if care is not taken, the tail will snap off.

A recent writer says:—"Often mistaken for snakes, the Pygopodiadae are confined to Australia. These lizards have lost the characteristic limbs; the hinder pair are, however, represented by two scaly flaps, which, when examined, are found each to contain five distinct toes enclosed in a common covering." They also use them like oars when moving over a smooth surface.

"Pygopodiadae are allied to the Pseudopus of Africa, being grey and spotted with white, the head having black markings."

The snake lizard is sometimes wrongly called a Slow Worm. The Slow Worm (*Aprasia pulchella*) in colour is brownish-yellow with small dotted black lines running down the whole length of the back. Its full length is only 7 inches.

"A lizard has a long tail, often nearly half its total length, whereas the snake has a short tail. Again, the lizard has ear openings; the snake has none. The lizard's eyes shut and open; the snake's do not.

They lay their eggs generally under logs or stones, and these appear to require a certain degree of moisture to hatch them, rather than heat. The same seems to apply to all reptiles' eggs."

I have verified these specimens by submitting them to the Museum authorities.

AN OLD BRITISH HERBAL.

By Thos. Steel.

By the kindness of my friend, Mr. C. Thackeray, I have had an opportunity of perusing a reprint of "Culpeper's British Herbal." The original was published somewhere about 1655 by Nicholas Culpeper, who is described as a "Student of Physic and Astrology." The work is illustrated with coloured plates of a high order of excellence, from which most of the plants dealt with could be readily identified. In reading the book one hesitates whether to wonder most why any sickness should still exist, so numerous are the plants cited as certain cures for every imaginable ailment, or at the child-like credulity which accepted without question statements attributing marvellous healing properties to a multitude of plants, when common experience must have proved the fallacy of these statements. However, time has sifted out much of the chaff, and now very few of the plants in question are used in medical practice. Culpeper wrote several other works from which some of the quotations following are taken.

Rosa Solis or Sundew.

Description.—It hath divers small, round, hollow leaves, greenish, but full of red hairs, which make them seem red, each standing upon his own footstalk, reddish and hairy. The leaves are continually moist in the hottest day, yea, the hotter the sun shines on them, the moister they are, with a sliminess that will rope, as we say, the small hairs always holding this moisture. Among these leaves rise up slender stalks, reddish also, three or four fingers high, bearing small white knobs one above another, which are flowers; after which come heads with small seeds. The root is a few small hairs.

Place.—It groweth usually in bogs and wet places, and sometimes in moist woods.

Time.—It flowereth in June, and then the leaves are fittest to be gathered.

Government and Virtue.—The sun rules it, and it is under the sign Cancer. Rosa Solis is accounted good to help those that have a salt rheum distilling on the lungs, which causeth consumption, and therefore the distilled water in wine is profitable for such to drink, which water will be of a good yellow colour. The same water is held to be good for phthisics, wheezings, shortness of breath, and cough; also to heal ulcers in the lungs; and it comforteth the heart and fainting spirit. The leaves outwardly applied to the skin will raise blisters, which

your garden, especially toward the full moon, they will grow more double, and many times change colour.
has caused some to think it dangerous to be taken inwardly. There is a drink made thereof with *aqua vitae* and spices, and without any danger, used in qualms and passions of the heart.

COWSLIPS, OR PEAGLES.

Both the wild and garden are well known.

Time.—They flower in April and May.

Government and Virtues.—Venus lays claim to this herb as her own, and it is under the sign Aries, and our city dames know well enough the ointment or distilled water of it adds to beauty, or at least restores it when it is lost. The flowers are held to be more effectual than the leaves, and the roots of little use. An ointment being made with them, taketh away spots and wrinkles of the skin, sun-burnings and freckles, and promotes beauty, they will remedy all infirmities of the head coming of heat and wind, as vertigo, false apparitions, phrensies, falling sickness, palsies, convulsions, cramps, pains in the nerves. The leaves are good in wounds, and the flowers take away trembling. If the flowers be not well dried and kept in a warm place, they will soon putrefy and look green. If you let the sun see them now and then, it will do neither the sun nor them harm.

Because they strengthen the brain and nerves, and remedy palsies, the Greeks gave them the name *paralysis*. The flowers preserved or conserved, and the quantity of a nutmeg taken every morning, is a sufficient dose for inward diseases, but for wounds, spots, wrinkles, and sunburnings, an ointment is made of the leaves and hog's lard.

BLUE-BOTTLE.

It is called Cyanus, Hurtsickle, because it turns the edges of the sickles that reap the corn, blue-blow, corn-blow, corn-flower, and blue-bottle.

Description.—Its leaves spread upon the ground, being of a whitish green colour, somewhat on the edges like those of Corn Scabious, amongst which ariseth up a stalk divided into divers branches beset with long leaves of a greenish colour, either but very little indented or not at all: the flowers are of a blue colour, from whence it took its name, consisting of an innumerable company of small flowers set in a scaly head, not much unlike those of Knap-weed; the seed is smooth, bright, and shining, wrapped up in a woolly mantle; the root perisheth every year.

Place.—They grow in corn-fields, amongst all sorts of corn, peas, beans, and tares excepted. If you transplant them into

Time.—They flower from the beginning of May to the end of harvest.

Government and Virtues.—As they are naturally cold, dry, and binding, so they are under the dominion of Saturn. The powder or dried leaves of the Blue-Bottle, or Corn-Flower, is given with good success to those that are bruised by a fall, or have broken a vein inwardly, and void much blood at the mouth: being taken in the water of plantaine, horse-tail, or the greater comfrey, it is a remedy against the poison of the scorpion, and resisteth all venoms and poison. The seed or leaves taken in wine, is good for the plague, all infectious diseases, and in pestilential fevers: the juice put into fresh or green wounds quickly closes the lips together, and it heals ulcers and sores in the mouth; the juice dropped into the eyes takes away heat and inflammation; the distilled water of this herb hath the same properties.

A few of the quaint statements regarding the virtues of some common plants may be further quoted.

Balm.—Let a syrup be made with the juice of Balm and sugar be kept in every gentlewoman's house to relieve the weak stomachs and sickly bodies of their poor neighbours. It causes the mind and heart to become merry, and revives the heart.

Lily of the Valley.—The root being roasted and mixed with hog's lard makes a gallant poultice, and the ointment made also of the root will cure burnings and trimly deck a blank place with hair.

Eyebright.—It is under the sign of the Lion, and Sol claims dominion over it. If the herb was but as much used as neglected, it would half spoil the spectacle makers' trade; and a man would think that reason should teach people to prefer the preservation of their natural before artificial spectacles.

Camomile.—The flowers of Camomile boyled in lye are good to wash the head and comfort both it and the brain. Nechessor saith the Egyptians dedicated it to the sun because it cured agues and they were like enough to do it for they were the arrantest apes in their religion that ever I read of.

Mint.—Extremely bad for wounded people; and they say a wounded man that eats mint, his wound will never be cured, and that is a long day.

Onion.—Take three or four great Onions, and having roasted them well in the embers, take off the outward pill, then bruise them with a few cummin seeds in powder, this applyed plaister-wise, in a few times using helps the head-ach. This I am persuaded, the hair being shaven off, is a good remedy for the Lethargy.

"THE WEEDS OF CIVILIZATION."

(Abstract from a lecture delivered by Mr. E. Cheel at the February meeting).

It is a well known fact that certain weeds are to be found wherever the civilized races establish their homes. On vacant allotments in the heart of the city of Sydney, for example, we find such plants as "Shepherd's Purse" (*Capsella bursa-pastoris*), "Flaxleaved Fleabane" (*Erigeron linifolia*), "Knot-Weed" *album*), "Potato-Weed" (*Galinsoga parviflora*), "Annual Po" (*Polygonum aviculare*), "White Goose-foot" (*Chenopodium* (*Poa annua*), "Sea Aster" (*Aster subulatus*), and several others, are the first weeds or vegetable emigrants that establish themselves on vacant allotments and even on building sites where buildings have stood previously for upwards of 100 years. One will notice that the above mentioned weeds will establish themselves in the course of a few months when the buildings have been razed to the ground. We know that the seeds of many weeds are carried in various ways, such as clinging to muddy soles of boots, the wheels of vehicles, on the feet of birds or even in their feathers, as well as being transported by mice, rats, and human beings, etc., by clinging to the fur of animals and the clothing of persons travelling from place to place. In modern clothing quite a large number of seeds may be carried about from one country to another in the turn-up bottoms of men's trousers. As one investigates the subject of weed distribution, and acclimatization of the adventitious flora more closely, it unfolds an extraordinary chapter in plant history, even within our own city boundaries, as there are so many ways in which seeds can be conveyed from place to place. We have only to examine the back-yards of any city dwelling, the outer yards of business establishments or other open spaces where air, sunshine and rain can gain access, and we shall find weeds of some kind growing without any assistance in the way of tilling the soil. Around flour mills, wool-scouring sheds, cattle-sale yards and garbage tips, quite a large number of alien weeds may be found. It has been shown by Hayward and Druce (The Adventine Flora of Tweedside, 1919) that 526 species of weeds have been collected at Montpellier, and 348 species at Tweedside, which have been transported from various countries (including, of course, different parts of Europe), by means of wool introduction.

They have also stated that "foreign grain accounted for about 40 species, and over 20 species occur about flour mills, ballast is responsible for 19 species, railways and navigation for 18 species, and about 31 hybrids have been produced in the area," so that it would appear that wool-scouring areas are the greatest nurseries of weeds. In view of the above mentioned particulars it would be of special interest to conduct similar enquiries concerning the number of weeds or other plants conveyed from various localities by means of fleeces of wool to wool-scouring factories in Liverpool and Waterloo in this State.

In our agricultural and pastoral districts we find quite a different type of weed, such as, for example, the "Noogoora Burr" (*Xanthium strumarium*), "Bathurst-Burr" (*X. spinosum*), "Star Thistle" (*Centaurea calcitrapa*), "Black Thistle" (*Carduus lanceolatis* or *Cnicus lanceolatis*), "Cockspur" or "Yellow-star Thistle" (*Centaurea salstitialis*), "Saffron or "False Star Thistle" (*Kentrophyllum lanatum*), and the "Black-berry Pest" (*Rubus fruticosus* or *R. discolor*). These are a few of the very worst kind that the farmer or pastoralist has to deal with. In our market gardens, as well as our home-gardens, the "Nut-grass" (*Cyperus rotundus*) and "Onion Weeds" (*Roumelia rosea*) and others are regarded as very bad weeds. The "Prickly Pear" (*Opuntia* spp.) and "St. John's Wort" (*Hypericum perforatum*) "Cats-Heads" (*Emex australis*) and "Field Bird-weed" (*Convolvulus arvensis*) are also serious pests in many parts of the Commonwealth.

In tropical or subtropical districts quite a different type of weed pest may be found, such as, for example, "Lantana" (*Lantana camara*) "Sensitive Plant" (*Mimosa pudica*) "Coffee senna" (*Cassia occidentalis*) and "West Indian Lead Tree" (*Leucaena glauca*). The latter is a plant of a shrubby habit—or, occasionally it grows into a small tree, producing round-headed creamy flowers and pods with an abundance of seeds used occasionally by the natives in the islands for necklaces, and has spread very rapidly in many parts of the tropics. It is particularly common everywhere in Fiji, following every track, road or tramway, or wherever a homestead has been established. Although it is generally regarded as a menace in Fiji, it is regarded as a useful plant in other parts of the tropics, and it is said to be useful for mothering young coffee and cocoa plants in newly planted plantations. It is also said to be useful as a mulch, and for green-manuring in rubber plantation, etc.; and in certain parts it is said to be used successfully (particularly in the Philippines) by forest officers against "Illuk Grass" (or Blady-grass as it is known in Australia) *Imperata arundinacea.*

Some few years ago it was introduced into the northern parts of this State by a certain seedsman under the name of "Mauritius Fodder Shrub," and quite recently it was distributed quite freely erroneously labelled as the "Algaroba Bean" (*Prosopis juliflora*). The latter produces an abundance of pods of a sweet taste, which are relished by all kinds of stock, but whilst it is stated by some authorities that cattle are fond of the leaves of the West Indian Lead tree (*Leucaena glauca*), it is stated by other authorities to be very harmful to horses, etc., as will be seen by the following account published in the *Gardener's Chronicle*, October 3, 1896, p. 397.

"Mr. D. Morris, assistant-director of the Royal Gardens, Kew, contributed a paper, which, in his absence, was read by Mr. Seward, on "The Singular Effect produced on certain Animals in the West Indies by feeding on the young shoots, leaves, pods, and seeds of the Wild Tamarind or Jumbai Plant (*Leucaena glauca*, Benth.)." The properties of this plant had received little or no attention in this country. It is commonly found along roadsides and in waste places in Tropical America. The plant was much more plentiful in the Bahamas than in Jamaica; it was, in fact, distinctly encouraged in the former islands as a fodder plant. The people were fully aware of the singular effect it produced on horses, causing them to loose the hair from their manes and tails. It also affected mules and donkeys. Its effect on pigs was still more marked. These animals assumed a completely naked condition, and appeared without a single hair on their body. Horses badly affected by Jumbai were occasionally seen in the streets of Nassau, where they were known as "Cigar-tails." Such dilapidated animals, although apparently healthy, were considerably depreciated in value. They were said to recover when fed exclusively on corn and grass. The new hair was, however, of a different colour and texture, 'so the animals were never quite the same.'

"One animal was cited as having lost its hoofs as well, and in consequence it had to be kept in slings until they grew again and hardened. The effects of the Jumbai on horses, mules, donkeys, and pigs were regarded as accidental—due to neglect or ignorance. The plant was really encouraged to supply food for cattle, sheep, and goats. The latter greedily devoured it, and were not perceptibly affected by it. It would be noticed that the animals affected were non-ruminants, while those not affected were ruminants.

"The probable explanation was that the ruminants, by thoroughly mixing the food with saliva and slowly digesting it, were enabled to neutralise the action of the poison and escape injury. The seeds probably contained the deleterious principle in a greater degree than any other part of the plant."

EXCURSION TO WOOLLAHRA POINT, POINT PIPER, SEPTEMBER, 1921.

Miss A. A. Brewster (President) acted as leader, and there were 27 present. A good start was made by a lecturette by the leader on what might be observed.

The Beach Zone was noted as a desert area as regards plant life, and also supported a limited amount of animal life owing to the absence of protective dominent growths such as oyster and tube-worm banks.

The general structure rock ravines harbouring different fauna and flora, was noted.

The uppermost zone harboured periwinkles (*Melaraphe*), the middle zone sea anemones and univalves, chitons, starfish and sea lettuce (*Ulva*), the deeper zone brown seaweeds, *Hormosira, Sargassum*, &c.

The specimens collected were:—Sea anemones (*Paractis* and *Oulactis*), Sea tube-worm (*Galeolaria*), Mollusca *Neritina, Monodonta, Helcioniscus, Drupa, Policinis, Acmea, Janthina* (the latter showing egg-floats). The Acorn barnacle (a degenerate crustacean) was also noted.

The work was interrupted by rain, and the party took shelter with Mrs. McMurtie (sister of the President), who kindly provided afternoon tea. Mr. Campbell, of Victoria, was a welcome visitor at the excursion, and Miss Hinder brought half-a-dozen students. Mr. Parry thanked Mrs. McMurtie for the kind hospitality, and the President for the trouble taken in the arrangements for collecting.

The President brought for reference the following papers on beach fauna:—

Presidential Address and Check list of Marine Fauna of New South Wales, both by C. Hedley, from the Proc. Royal Socy. N.S. Wales.

EXCURSION TO KILLARA--NOVEMBER, 1921.

The leaders at this excursion were the President (Miss A. A. Brewster, F.T.C., and Miss Saunders, B.A., while Mr. Parry acted as guide. About 27 members were present.

The leaders pointed out the ecological aspect of the flora, noting the tall straight trunks of the gums on the shale area, and the gradual diminution in size as the true sandstone area was reached with its more stunted growth. Collections were made of various types and bunches of red-tipped gums, and of flannel flowers were obtained on the sandstone ridges above the gully. A patch of swampy country was examined where the last of the sowerbeas and *Epacris obtusifolia,* sundews, etc., were observed.

Miss Winter and Sigal were the active entomologists of the party, the latter finding the caterpillar of one of the cequosid moths, with beautiful markings blending with the leaf coloration of *Banksia serrata.* Miss Sigal is making a special study of life histories of moths and butterflies, and will be glad to get larvae, etc., from members, who will please noteh the food plant where possible. Such specimens could be brought to the meetings.

Mr. Duckworth gave some interesting remarks on the cultivation of native plants (especially orchids) in which he and his brother take great interest. After a rather hot walk the party was received by Mr. and Mrs. Parry at their home at Killara, who provided a much appreciated afternoon tea. The President (Miss Brewster) thanked their hosts for their kindness, and Mr. Parry responded.

NOTES AND COMMENTS.

AMARYLLUS BELLADONNA, HORT. VAR.

At the meeting in July, 1921 (*Aust. Nat.* IV. 178) Miss Drummond exhibited flowers of this plant from her garden showing peculiar markings. Mr. Cheel remarks as follows on these:—These specimens, which he had not had an opportunity of seeing, had peculiarly marked petals instead of the normal pink. It is not easy to give a precise cause, but he would suggest that the original bulbs had developed a "sporting" offshoot or bulbil, or cross pollination had occurred between two coloured forms and the resulting seedling had grown alongside the original bulbs and the flowers showed the results of the cross

Iron Pyrites Crystals.—Iron pyrites (sulphide of iron) occurs in many different forms. Its crystalline system is cubic and the crystals assume the perfect cube and also the pyritohedron, a modification of the true form. The crystals in the specimens from Leadville show remarkable regularity. They include both types, and often show the characteristic striae at right angles to those of the adjacent face.

H. R. DRUMMOND.

Fulgurites.—These objects, also known as "lightning tubes," are comparatively rare. They are occasionally found in the sand dunes around the coast, having been formed by lightning striking the sand. When lightning strikes the sand the resistance offered to its passage generates intense heat whereby the moisture in the sand is vapourised, forming an open channel or pipe, the sand grains around which are fused along the path taken by the lightning. As the lightning travels downwards to the wetter sand, it becomes diffused and the walls of the tube become rougher and less perfectly fused. Many of the tubes enclose roots of plants which have grown down them subsequent to their formation. In some cases I might suggest that the lightning has followed the course of a root, as many of the tubes closely resemble roots in outline. Many of the tubes are decidedly flattened, in fact few are perfectly round in section. This may be accounted for by the pressure of the surrounding sand when the tube was soft from the state of fusion.

Professor David tells me that he traced a fulgurite down in the sand for fourteen feet and it was still travelling downwards. Those at Port Macquarie, however, do not generally extend for more than three feet below the surface. The fused silica appearing as a glassy substance with bubbles visible in it may be seen on the inside of most of the tubes.

HEATHER R. DRUMMOND.

PINNOTHERES PISUM, A PARASITIC CRAB. This elegant little crab is parasitic between the valves of the common Pipi (*Donax deltoides*). An interesting feature is that the male is unknown, those found always being females and frequently carrying eggs. The abdomen is relatively unusually large, more so than in most other crabs. The actual location in the pipi is in the mantle cavity. The specimens shown were from Port Stephens.

P. D. MURRAY.

AERENCHYMA. The aeration of plants is made possible by means of intercellular spaces between the cells. The stomates of leaves and lenticels of stems are the "doors" through which air enters the plant. Air also enters the roots dissolved in the water taken in by the root hairs, hence certain mangroves which have the roots in thick mud send up special aerating roots armed with lenticels through which air is taken in. But many marsh plants have to store air and to do this develop within the soft cells of parenchyma of cortex and pith especially large spaces as air-stores, such tissue being termed *aerenchyma*. This can be seen in the pneumatophores (aerating roots) of *Avicenna* (mangrove), *Jussiaea,* Nardoo, &c. The name aerenchyma is also given to the plates of parenchyma between which are large air spaces as in the bulrush (*Typha*).

AGNES A. BREWSTER.

THE MOUND ANT. In open scrub at Pennant Hills, in May, 1921, I noticed that several plants of the common fungus *Lepiota dolichaula* had sprung up in the centre of a nest of the Mound Ant (*Iridomyrmex detectus*). The ants were very active biting off pieces of the fungus and carrying them apparently into the nest. On again visiting the nest a few days later, the fungi had entirely disappeared. Fungi of the same species growing close by were not touched. This ant appears to dislike having any herbage on its nests, these being usually quite bare.

T. STEEL.

ZEUZERA LARVAE. Mr. L. Gallard showed two butts of small wattle saplings about 4 inches in diameter. One of these contained two large *Zeuzera* moth larvae which had constructed their long silk lined tunnels extending out of the roots and upwards until they were a little above the surface of the soil. This enables the larva to work too and fro, and (after heavy soaking rain) thus reach a point of safety when the lower part of the tunnel would be flooded with water.

The other butt was split down the centre to show the huge tunnel made by these larvae.

GREEN TREE-HOPPERS (MEMBRAICIDAE). Mr. Gallard also exhibited a cluster of the eggs of this insect, numbering over 80. These are laid on end in a double row and extend for about 4 inches along the twig, illustrating what wonderfully clever work can be done by some of these small creatures by means of a pair of anal appendages termed cerci which act like fingers in placing the eggs in position. The newly hatched hoppers in their first instar somewhat resemble mound ants, but with successive moults they more and more resemble the mature insect.

ACACIA INTERTEXTA, SIEB. At the November meeting Mr. Cheel exhibited specimens of this plant which is synonymous with *A. obtusifolia,* A. Cunn., collected about 24 miles from Wingham, which were in bud and were identical with specimens growing at Hill Top on the main Southern line and on the Blue Mountains. These are frequently confused with the Sydney Golden Wattle (*A. longifolia*) but the latter flowers during the months of August and September and sets its seed freely, whereas *A. intertexta* flowers during December and January and very rarely sets seed. A note on this species was published in the Jour. Royal Socy., N.S. Wales, XLVIII. (1914) 22, drawing attention to the different characteristics of growth, etc., and the finding of this species on the Cambogne shows that it has a very wide range. There are specimens in the National Herbarium found at Pheasant's Creek, Glen Elgin and on the Macpherson Range, which have previously been confused with *A. longifolia.*

ORCHIDS FROM CENTENNIAL PARK. Mr. Cheel also read a list of orchids collected in the Centennial Park, Sydney, between the years 1898 and 1901, as follows:—*Caladenia coerulea, C. alba, C. carnea, Pterostylis acuminata, P. concinna, P. nutans, P. parviflora, Glossodia minor, G. major, Lyperanthus nigricans, L. sauveolens, Cryptostylis erecta, C. longifolia, Eriochilus autumnalis, Diuris maculata, Thelymitra longifolia, T. carnea, T. nuda* (?), *Spiralis australis, Microtis porrifolia, Acianthus fornicatus, Caleyana major, Phrasophyllum elatum* and *P. Woollsii* (?). The latter was not found actually within the fence boundary, but on the Red Hill, a few yards away from the fence.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE GEM-STONES OF THE BIBLE.

Lecture delivered 2nd May, 1922.

By Thos. Steel.

Frequent mention is made in different parts of the Bible of various stones, minerals and gems, and it will I trust be not only interesting, but instructive, to devote a little time to the consideration of precisely what was referred to when any particular stone or gem is mentioned. Apart from the importance naturally attaching to a detailed study of any aspect of the Bible narrative, exact knowledge is of considerable additional value when we come to deal with the significance of the references to objects such as those which we are now considering, for the possibility of gleaning the full meaning of an allusion very often depends on the correct interpretation of the name given by the original Hebrew or Greek writer to the object indicated.

It must not be thought that the stones and gems alluded to in Holy Writ are all native to Palestine or even to the immediately surrounding countries, for the greater number of the minerals mentioned in the Bible are precious stones which do not occur in the Holy Land, but must have been brought by traders from distant sources. We find references for instance, to the "land of Havilah (near the reputed site of the Garden of Eden), where there is gold . . . . there is the bdellium and onyx stone" (Gen. 2, 11, 12), we find "gold of Parviam" (2 Chron. 3, 6), "gold of Ophir" (Job. 28, 16), "topaz of Ethiopia" (Job. 28, 19), while the breastplate of the High Priest with its brilliant array of jewels was in use when the Israelites were sojourning in the desert of Sinai, and the jewels were probably derived from those brought from the land of Egypt. We know that as early as about 600 B.C. in the days of the prophet Ezekiel, Tyre was famous as a centre of commerce, the Phoenicians being without doubt the greatest nation of traders then in existence, and having in their hands great commercial interests. Thus Ezekiel 27, 3, "And say unto Tyrus, O thou that art situate at the entry of the sea, which art a merchant of the people for many isles." Further that mineral products played a large part in the trade of Tyre is evidenced by other passages in the same chapter:—"Tarshish was thy merchant by reason of the multitude of all kind of riches; with silver, iron, tin and lead, they traded in thy fairs. Javan, Tubal, and Meshech, they were thy merchants: they traded the persons of men and vessels of brass in thy market. . . . . Syria was thy merchant by reason of the multitude of the wares of thy making: they occupied in thy fairs with emeralds, purple, and broidered work, and fine linen, and coral, and agate . . . . . Dan also and Javan going to and fro occupied in thy fairs: bright iron, cassia, and calamus, were in thy market. . . . . The merchants of Sheba and Raamah, they were thy merchants: they occupied in thy fairs with chief of all spices, and with all precious stones, and gold."

It is not an easy matter in many cases to make certain of precisely what stone is meant by a particular name in our Bible, for the reason that not only has the significance of the word used in some instances altered in course of time, but occasionally a name formerly attached to a particular stone is now applied by us to one quite different, or the incidence of the original name has been lost altogether. Further, stones formerly grouped together under a common title have, with the progress of science and the perfection of means of differentiation, been separated and given distinctive names, and it is sometimes impossible to make certain of which of these was actually referred to when the original name was mentioned in the Bible; while again, stones which were formerly considered quite distinct are now known to be merely varieties of the same gem. Thus the Romans under the name carbunculus included various red, hard, transparent stones which we now separate into different mineral species, bearing different names, amongst which are such well known gem stones as, corundum (Oriental ruby), spinel (Balas ruby), garnet, varieties of which are almandine and pyrope, all of these differing from one another in important constitutional properties though all possess the common attributes of hardness, transparency and colour.

We find in the Bible numerous scattered allusions to particular gem stones, in most cases the reference being purely figurative, as for instance in Exodus 24, 10—"and they saw the God of Israel; and there was under his feet as it were a paved work of a sapphire stone, and as it were the body of heaven in his clearness." Some of these will be dealt with when we are considering the identity of particular gems, but in others the significance of the allusion is sufficiently obvious.

References of a general nature to jewels, apart from any particular gem, are frequent throughout the Bible. Thus both in Proverbs and The Book of Job we find wisdom compared to jewels, while the records in Exodus of the spoiling of the Egyptians and the gifts of jewels for the decoration of the Temple, are familiar to all.

One of the most striking of these references is that in Malachi 3, 17—"And they shall be mine, saith the Lord of hosts, in that day when I make up my jewels; and I will spare them, as a man spareth his own son that serveth him." The term is here used figuratively in describing the preciousness of the Saints to Almighty God. This sentence forms the text for the beautiful children's hymn by Cushing:—"When he cometh, when he cometh to make up his jewels."

With these introductory remarks in our minds we may pass on to consider some of the more notable allusions to precious or gem stones.

Easily first in interest, importance and beauty of imagery may well be placed the description in the Book of Revelation, 21, 19, 20, of the foundations of the New Jerusalem:—"And the foundations of the wall of the city were garnished with all manner of precious stones. The first foundation was jasper; the second, sapphire; the third, a chalcedony; the fourth, an emerald; the fifth, sardonyx; the sixth, sardius; the seventh, chrysolyte; the eighth, beryl; the ninth, a topaz; the tenth, a chrysoprasus; the eleventh, a jacinth; the twelfth, an amethyst."

Of this imposing list of stones, four only are mentioned elsewhere in the New Testament, all the references being also contained in the Book of Revelation. These are, jasper, sardius and emerald in Rev. 4, 3, "and he that sat was to look upon like a jasper and a sardine stone: and there was a rainbow round about the throne, in sight like unto an emerald." Jasper is again mentioned in Rev. 21, 18, "and the building of the wall of it was of jasper: and the city was pure gold, like unto clear glass."

While jacinth is spoken of in Rev. 9, 17, "and thus I saw the horses in the vision, and them that sat on them, having breast-plates of fire, and of jacinth, and brimstone."

At this point one can scarcely help recalling to mind the words of the hymn by Bernard of Cluny, on the glories of the Heavenly City:—

"With jasper glow thy bulwarks,
Thy streets with emeralds blaze,
The sardius and the topaz,
Unite in thee their rays."

In the authorised version the English names used for the various stones are usually merely adaptations of the original Greek terms, and, as has already been indicated, are at the present time in some cases applied to totally different stones than those which were designated by the original names. Thus, according to Pliny, who lived during the New Testament period, the topazion or topaz was a hard green stone found on an island in the Red Sea. The stone which we call topaz is quite different from this, while the topaz of Pliny corresponds exactly with that which we now call peridot.

It is thus evident that for a due understanding of this aspect of the Bible narrative, we must ascertain in as far as is possible, what stone was really meant by any given name in Bible times, rather than that for which the name may now be used in our own language.

S. John, to whose writings we are indebted for the valuable records in the Book of Revelation, was a contemporary of Pliny, who, born in 23 A.D., lost his life in 79 A.D., by the eruption of Vesuvius which destroyed Herculaneum and Pompeii. Pliny in his works on natural history gives a complete account of the knowledge of minerals possessed by students at the time when John wrote his books. Taking then the stones of the foundations in the order in which they are given by John, we may readily ascertain what Pliny says about them.

The first stone of the foundation, in the Greek, is iaspis, which has been translated jasper. Of this stone Pliny says:—"There are fourteen varieties which are usually green and transparent. Many countries produce this stone; that of India is like smaragdus in colour; that of Cyprus is hard and a full sae-green; and that of Persia and Caspia a sky-blue. On the banks of the river Thermodon the iaspis is of an azure colour, in Phrygia it is purple; and in Cappadocia of an azure-purple, sombre and not refulgent. The best kind is that which has a shade of purple, the next best being rose-coloured, and the next the stone with the green colour of smaragdus." In modern times the term jasper is restricted to opaque stones; the green transparent iaspis of Pliny, and the stone meant by John, was probably identical with that which we now call plasma, and which is a form of chrysophrase, a variety of chalcedony.

The second foundation was in the Greek, sappheiros, which, in the Latin of Pliny, is sapphirus, and is described by him as azure in colour, rarely purple, with refulgent spots like gold. "In no case," he says, "is this stone transparent. The best kinds come from Media." This description has nothing in common with our present-day sapphire, but corresponds exactly to lapis lazuli. When ground this beautiful stone was used as a pigment by the early painters, giving a valuable permanent blue. The yellow spots consist of sulphide of iron and constitute a great drawback in cutting the stone for ornamental purposes. It was largely used for architectural ornamentation during the Middle Ages and the Renaissance. The Chapel of San Martino at Naples, and an apartment in the Tsarskoe Palace, Petrograd, are perhaps the most notable existing examples of this use.

The third foundation is stated to be chalkedon. The only Chalkedon—in the Latin form of the word—mentioned by Pliny, is the *town* of that name standing on the Bosphorus probably close to where Scutari is now situated. The town had been noted for its copper mines, which, however, in Pliny's time had been worked out. Pliny speaks of a kind of smaragdus (a green stone) as being found here, but states that though of brilliant colours resembling the feathers of the peacock, the stones were brittle, of small size, and not of much value. He elsewhere mentions as being found at the same place, an iaspis of turbid hue. It is probable that the stone meant by John was a variety of smaragdus, a green stone which is found near Patmos or Ephesus, where he was when he wrote the Book of Revelation, and which we now know as amazon stone.

Fourth foundation, smaragdos,—Latin smaragdus. Of this stone Pliny enumerates twelve varieties, the colour of all of which was green. Of these, what we now call the emerald was one, and we may fairly conclude that this was the stone composing the fourth foundation.

Fifth foundation, sardonux. In Biblical times this name was given to a red and white sarda, a transparent stone from India. The Arabian sardonyx was black or azure as a base with vermillion surrounded by white above. This stone is still called sardonyx.

Sixth foundation, sardion.—Latin sarda. This stone was in much demand by seal engravers. There were several varieties, some red and others yellow, all being transparent. Our sard and carnelian are probably the same stone. At the present time it is largely used for seals, pendants, beads and other ornaments.

Seventh foundation, chrusolithos,—Latin chrysolithus. This, according to Pliny, was "a transparent stone, with a refulgence like gold." Under the name were probably included our yellow sapphire and yellow jacinth, so that one or other of these stones would be meant. At the present time the term "chrysolite" is used for a different stone altogether, a yellow variety of olivine. Peridot is a green variety of the same mineral.

Eighth foundation, berullion,—Latin beryllus. The most esteemed form of beryl was the sea-green. It is one of the varieties of emerald, and it is considered that the sea-green stone of Pliny's time was that mentioned by John, and which is still known by the same name.

Ninth foundation, topazion. This stone, the only one of the precious stones which was soft enough to yield to the file, was valued for its fine green colour. It was not the same as our topaz, which is a silicate of alumina and one of the hard gem-stones. The stone known as topazion corresponds to our peridot, a variety of chrysolite, a stone having numerous varieties, and the basis of which is silicate of iron and magnesia.

Tenth foundation, chrusoprasos. In Pliny's time the chrysophrasus was looked upon as a variety of beryllus of a tint more golden than green. The stone in question is now considered to be a green chalcedony, a variety of plasma.

Eleventh foundation, huakinthos. Latin hyacinthus. This is described by Pliny as a violet stone, somewhat like amethystus in colour, but otherwise quite different in appearance. It corresponds, so far as we can see, with our blue sapphire.

Twelfth foundation, amethustos. Several varieties of this stone are known, all of a purple colour, and it is in all probability the same stone as we now name amethyst.

Pliny mentions several other valued gem stones which, however, are not in the list of foundations given by John; these include amongst others, onyx, carbunculus, calliana—probably our green torquoise, opalus and agate.

The foundations then were probably as stated in the table:—

Foundations of the New Jerusalem.

	Greek	*Latin*	Present *English name*	*Colour*
1.	Iaspis	Iaspis	Chrysophrase	Green
2.	Sapphieros	Sapphirus	Lapis lazuli	Blue
3.	Chalkedon	Chalcedon	Amazon stone	Green
4.	Smaragdos	Smaragdus	Emerald	Green
5.	Sardonux	Sardonyx	Sardonyx	Red & White
6.	Sardion	Sarda	Carnelian	Red
7.	Chrusolithos	Chrysolithus	Sapphire	Yellow
8.	Berullion	Berillus	Beryl	Olive-green
9.	Topazion	Topazion	Peridot	Sea-green
10.	Chrusophrasos	Chrysophrasus	Chalcedony	Pale-green
11.	Huakinthos	Hyacinthus	Sapphire	Purple or Blue
12.	Amethustos	Amethystus	Amethyst	Purple

Next in order of importance as a collection of jewels may be placed the Breast-plate of the High Priest. In Exodus 28, 17-21, we find the arrangement of these stones given in full detail:—

"And thou shalt set in it settings of stones, even four rows of stones; the first row shall be a sardius, a topaz, and a carbuncle: this shall be the first row.

"And the second row shall be an emerald, a sapphire, and a diamond.

"And the third row a ligure, an agate and an amethyst. And the fourth row a beryl, and an onyx, and a jasper, they shall be set in gold in their inclosings.

"And the stones shall be with the names of the children of Israel, twelve, according to their names, like the engravings of a signet; every one with his name shall be according to the twelve tribes."

The list then as given in Exodus is as follows:—

1st Row.

Hebrew	*Greek*	*English*
Odem	Sardion	Sardius
Pitdâh	Topazion	Topaz
Bâréqeth	Anthrax	Carbuncle

2nd Row.

Hebrew	*Greek*	*English*
Nôphek	Smaragdos	Emerald
Sappir	Sappheiros	Sapphire
Yahalôm	Adamas	Diamond

3rd Row.

Hebrew	*Greek*	*English*
Léshem	Ligurion	Ligure
Shebô	Achates	Agate
Ahlâmâh	Amethustos	Amethyst

4th Row.

Hebrew	*Greek*	*English*
Tarshish	Berullion	Beryl
Shôham	Onuchion	Onyx
Yâshepheh	Iaspis	Jasper

The Ephod of the High Priest, as fully described in Exodus, chapters 28 and 39, was a sort of coat of fine linen made in two pieces, one for the front and one for the back of the wearer. The pieces were joined over the shoulders by a couple of clasps, made of gold, each set with an onyx stone on which was engraved the names of the twelve tribes, six names on each stone, as a memorial of the promise of the Lord to Israel. The breastplate which was about 8 to 10 inches square, was made of the same material as the Ephod, and was folded to form a bag in which the ceremonial stones *Urim* and *Thummin* were placed. On the outside of the gorget or breastplate, were mounted in gold settings, the twelve stones. There is some difference of opinion amongst students as to the nature and use of the stones Urim and Thummin, but the best authorities hold that they were used by the Priests in a kind of sacred lottery, Urim meaning "aye" and Thummin "nay." If we turn to the Hebrew text of 1 Sam. 14, 41-42, as given in the Septuagint translation, we find it is a good deal fuller than in the Authorised Version, and runs thus:—"And Saul said: 'O Jehovah, God of Israel, why dost Thou not answer Thy servant today?' If this fault be in me or in Jonathan my son, give Urim, and if it be in Thy people Israel, give Thummin. And the lot fell upon Saul and Jonathan, and the people escaped. And Saul said:—'Cast (the lot) between me and Jonathan my son, and on whomsoever Jehovah shall cause the lot to fall let him die.' So they cast (the lot) between him and Jonathan his son, and Jonathan was taken." This makes it clear that by means of a series of tests, the replies to which were "yes" and "no," the guilt or otherwise of suspected parties was determined by the aid of the stones. There is ample evidence that the ceremonial use of Urim and Thummin ceased at a comparatively early period, though the stones still continued to form part of the equipment of the High Priest. We have no definite knowledge of the nature of the materials of which they were made, nor even of the meaning of the names. Urim and Thummin have been generally interpreted as Light and Perfection, but the accuracy of this rendering is more than doubtful. It has been suggested that the former of the two names is derived from the Hebrew root *arar*, "to curse" and the latter from another root signifying, "to be without fault."

The period of captivity in Babylon from about 606 to 534 B.C., resulted in a certain amount of corruption of the language of the Jewish people, so that on their return to Palestine the vernacular was a mixture of Hebrew and Caldee, and the old pure Hebrew was no longer understood—(Nehemiah 8, 6-8), "and Ezra . . . . also Jeshua, and Bani . . . ., caused the people to understand the law. . . . . So they read in the book in the law of God distinctly, and gave the sense, and caused them to understand the reading."

Owing to this a good deal of dificulty exists in the interpretation of many little-used words, and particularly, technical terms such as the names of gems.

It was not until somewhere between 270 and 280 B.C. that the Septuagint translation of the Old Testament into Greek was carried out, and in this the above list of stones in the breastplate is given, with the difference that chrusolithos is substituted for adamas. That is sapphire for diamond. This shows that the Greek and English translators of the Old Testament must have had different Hebrew words in the manuscripts on which they worked, or have translated the words differently. The translation of a Hebrew name into Greek *adamas* and English *diamond* cannot be correct, for the reason that there was no diamond large enough to form one of the stones; and as we know each stone had engraved on it the name of a tribe, and the art of engraving on diamond was unknown to the Jews, and in fact was only discovered within comparatively recent years, some other stone must have been used. Indeed, it is somewhat doubtful if the ancient Jews were acquainted with the diamond as a gem stone. The original breastplate was lost during one of the earlier of the numerous disastrous periods when Jerusalem was captured, and the Temple plundered by various invaders; thus, by Shishak, King of Egypt, about 971 B.C. (1 Kings 14, 25-26), "and it came to pass in the fifth year of King Rehoboam, that Shishak, King of Egypt, came up against Jerusalem; and he took away the treasures of the house of the Lord, and the treasures of the King's house; he took away all;" and (II. Chron. 12, 9), "so Shishak, King of Egypt, came up against Jerusalem, and took away the treasures of the House of the Lord," or about 588 B.C. as recorded in II. Kings 24, 13; 25, 15; II. Chron. 36, 18; Jeremiah 39, 8; 52, 13, 19; Daniel I., 2; when Nebuchadnezzar came against the city, "and he carried out thence all the treasures of the house of the Lord . . . . and cut in pieces all the vessels of gold which Solomon, King of Israel, had made in the temple of the Lord," or later, when Ptolemy Soter, King of Egypt, about 320 B.C., carried off the replica which had been made and which was in use at the time of the Septuagint translation, or, again, in 198 B.C., when Antiochus the Great captured the city and despoiled the Temple, or in 170 B.C., as related in one of the books of the Apocrypha (1 Maccabees 1, 20-24), when Antiochus Epiphanes stormed the city and plundered the Temple, taking away all the valuable furnishings. Then in 54 B.C. the unfortunate city met the same fate at the hands of Crassus. In 19 B.C. the rebuilding of the Temple was commenced by Herod.

From all this we may be sure that the later breastplates were a series of reproductions made from time to time to replace those taken away at the various periods mentioned, and we know that a breastplate was in ceremonial use at the time of the capture and destruction of the city by Titus in 70 A.D., about 300 years after the translation of the Pentateuch. There can be no doubt that successive breastplates were not exact replicas of the original one made for Aaron. It would not always be possible to get the correct gems, and so use would have to be made of such as were available.

After this period Jerusalem ceased to be the centre of Hebrew influence in Palestine, the headquarters of the religious life of the nation being transferred to the new city of Tiberias, which had been founded by Herod Antipas early in the first century A.D.

In passing, it may be well to mention that the Pentateuch or Torah was the Jewish Bible or Book of the Law, and consisted of the five books, Genesis to Deuteronomy wheih are placed first in our Bible. The Septuagint was the translation of these books into Greek, the name being afterwards applied from the legend that 70, or more correctly 72, translators carried out the work, 6 for each of the tribes of Israel. At a later period other books were translated and added to the Septuagint, but in its original form it contained only the five mentioned.

There are several sources from which we can gather information regarding the details of the breastplate. We have, of course, the Authorised and Septuagint Versions of the scriptures. Josephus, who was born about 37 A.D., and who from his position at one time as a Priest of the Temple and afterwards when writing his history at Rome under the patronage of the Emperor Vespasian, had ample opportunities of familiarising himself with the details of the Temple furnishings, has left us a detailed account of this important adjunct to the ritual of the Temple. The list of stones given by him agrees with that of the Septuagint version, except that he substitutes sardonux for sardion, and somewhat alters the order of arrangement. As Josephus wrote from actual knowledge of the breastplate, we may conclude that the replica which was in use in his time is accurately described, and that the differences indicated had crept in during the making of new plates to take the place of those removed at various times by the different plunderers. One of the incidents mentioned by Josephus in his account of the destruction of Jerusalem by Titus, of which he was an eyewitness, is that a priest of the Temple was granted his life by Titus in reward for delivery to the Romans "the precious stones and a great number of precious vessels that belonged to their sacred worship." The Latin version of the Bible, known as the Vulgate, was written about 400 A.D., by Eusebius Hieromymus, better known as Saint Jerome, who had access to old Hebrew manuscripts which have since been lost.

Drawing together the lists as given by these different authorities, we find a remarkable agreement as to the identity of the stones, though there are discrepancies in such matters as the order of their arrangement. It should be remembered that a Hebrew writer would in making out his description begin with the stone on the right-hand and describe them in order from right to left, whereas a western writer would follow the reverse order. It is easy to see how irregularities in the description might creep in through causes such as this.

The lists as given by the four authorities mentioned may be tabulated:—

1st Row.

Auth. Vers.	*Sept. Vers.*	*Josephus.*	*Vulgate.*
Sardion	Sardion	Sardonux	Sardion
Topazion	Topazion	Topazion	Topazion
Anthrax	Smaragdos	Smaragdos	Smaragdos

2nd Row.

Auth. Vers.	*Sept. Vers.*	*Josephus.*	*Vulgate.*
Smaragdos	Anthrax	Anthrax	Anthrax
Sappheiros	Sappheiros	Iaspis	Sappheiros
Adamas	Iaspis	Sappheiros	Iaspis

3rd Row.

Auth. Vers.	*Sept. Vers.*	*Josephus.*	*Vulgate.*
Ligurion	Ligurion	Ligurion	Ligurion
Achates	Achates	Amethustos	Achates
Amethustos	Amethustos	Achates	Amethustos

4th Row.

Auth. Vers.	*Sept. Vers.*	*Josephus.*	*Vulgate.*
Berullion	Chrusolithos	Chrusolithos	Chrusolithos
Onuchion	Berullion	Onuchion	Onuchion
Iaspis	Onuchion	Berullion	Berullion

It is thus seen that each of the descriptions differs in the order of arrangement, but that the Septuagint, Josephus and the Vulgate agree in the names included, except as has already been mentioned, Josephus gives sardonux instead of sardius, while the authorised version includes diamond (adamas) and omits chrusolithos. I have already explained why the diamond must be rejected as one of the constituent stones. Finally, accepting the preponderating evidence in favour of the Septuagint list we may conclude that the following was a very probable arrangement:—

1st Row:	2nd Row:	3rd Row:	4th Row:
Sardion	Anthrax	Ligurion	Chrusolithos
Topazion	Sappheiros	Achates	Berullion
Smaragdos	Iaspis	Amethustos	Onuchion

It now only remains to identify these with the stones as we now name them, and in this task valuable assistance is derived from a learned Greek, Theophrastus, who wrote a work on minerals, the earliest on the subject which has come down to us. Theophrastus lived about 370-287 B.C., so that he wrote just before the period when the Septuagint translation was carried out (270-280 B.C.). He mentions nine out of the twelve names given in the Septuagint, and combining with his the descriptions given by Pliny, we may state the names as follows:—

1st Row:	2nd Row:	3rd Row:	4th Row:
Carnelian	Carbuncle	Citrine	Sapphire
Peridot	Lapis Lazuli	Agate	Beryl
Amazon Stone	Chrysophrase	Amethyst	Onyx

Some students have identified the Ligure of the Bible with the lyncurium of Dioscorides and other writers. This was a mythical name connected with the animal know as the Lynx applied to what we now know to be *Belemnites* the fossil pen of a cephalopod—an extinct cuttle-fish—, which for many years have been popularly known as "thunderbolts" and to which magical properties were attributed. There can be little doubt, however, that ligure is identical with the lugkurion of Theophrastus, which was a hard yellow stone, used by seal engravers, transparent and difficult to polish, and which we identify with our yellow sapphire. The belemnite is a soft fossil by no means ornamental, and it is extremely unlikely that such an object would be chosen for purposes of ornamentation.

It will be of interest to endeavour to trace the Tribal names of Israel which were associated with the different stones of the breastplate. There is a good deal of evidence pointing to the association in history of the 12 signs of the Zodiac of the Greeks, the 12 months of the year, the 12 tribes of Israel, the jewels of the King of Tyre, and the 12 foundations of the New Jerusalem, but this is too large a subject to be dealt with here. From this association, however, undoubtedly arose the very old custom of wearing a particular gem as a birthstone or for an astral or zodiacal stone, the one chosen corresponding with the month of birth. The history of the tribes is extremely involved, but we know that the original twelve were the descendants of the twelve sons of Jacob. In Genesis 29, 35, 46 and 49, the 12 names are identical, though the order of arrangement is different in each place. In Exodus 1, Joseph's name is not included, owing to his absence in Egypt. Other tribes arose at later stages. Thus, in the lists given in Numbers, Levi drops out, because, being of the priestly caste, they possessed no land, while Joseph's place is taken by his sons, Manasseh and Ephraim. Later still there are further changes till in 1 Chron. 12 we have no less than 14 tribes mentioned, Levi being included, but Joseph replaced as before by Manasseh and Ephraim, the former being again split into two.

Associating then the names of the tribes in the genealogical order in which they occur in the earliest list in the Book of Genesis, with the stones in the sequence at which we have arrived for the probable earliest arrangement of the breastplate, we get the following tabulation, which represents a quite probable arrangement:—

	1st Row.	
Carnelian	Peridot	Amazon Stone
Reuben	Simeon	Levi
	2nd Row.	
Carbuncle	Lapis Lazuli	Chrysophrase
Judah	Dan	Napthali
	3rd Row.	
Citrine	Agate	Amethyst
Gad	Asher	Issacher
	4th Row.	
Sapphire	Beryl	Onyx
Zebulun	Joseph	Benjamin

(Written in Latin form from left to right.)

Amongst so many conflicting accounts of the details of the breastplate it is not possible to state definitely what was the original arrangement, we can only endeavour by studying the available descriptions, to arrive at what appears most probable, and this is what I have tried to do. It is extremely probable that differences in arrangement did occur at successive periods, and that therefore the original arrangement became more or less altered.

We know the affection which the faithful of the Jewish race entertain for the ancient capital city of their forefathers, and the peculiar veneration with which they regard its venerable, crumbling walls, a veneration which, owing to hallowed associations, is shared by Christians all the world over.

This being so, we may regard with interest a fragment of grey stone picked up at the base of the walls of Jerusalem, knocked off mayhap in the course of one of the occasions of siege, when nothing but these old limestone walls stood between the devoted inhabitants and their cruel rapacious enemies.

We will now pass on to consider another great collection of gems, the ornaments of the King of Tyre, recorded in Ezekiel 28, 13. The authorised version gives the following reading of the passage:—"Every precious stone was thy covering, the sardius, topaz, and the diamond, the beryl, the onyx, and the jasper, the sapphire, the emerald, and the carbuncle and gold." We thus see that only nine stones are mentioned, and that gold is added at the end of the list. In the Septuagint version, on the other hand, the 12 stones previously mentioned in the account of the High Priests' Breastplate, are all given, including the 9 of the Authorised Version, and with gold and silver intercalated in the middle of the list. The three names missing from the Authorised Version are the ones forming the 3rd row in the breastplate, as described in the Book of Exodus, and this can be easily explained as an accidental omission on the part of the writer who copied the MSS when dealing with technical terms with which he was not familiar.

In the Authorised Version, although the order in which the stones are mentioned differs in the breastplate list in Exodus and the King of Tyre list in Ezekiel, the two lists are with the exception of the omissions noted, and the inclusion of gold and silver in Ezekiel, otherwise identical. In the Septuagint Version, however, not only do the names agree in the two lists, but the order in which they are placed is the same, the only difference being the addition of gold and silver to the list in Ezekiel.

Other stones and objects valued for ornamental or useful purposes, mentioned in the Bible, may be conveniently dealt with here. These comprise alabaster, crystal and rubies, besides coral, pearl and ivory, which are of animal origin, and amber, a fossil vegetable resin. The alabaster of Theophrastus was a variegated marble, which was brought principally from Thebes, in Egypt. Pliny states that the sort most valued was honey-yellow, covered with curling spots, and was not transparent. It is still a custom in Egypt to keep ointments in so-called "alabaster" boxes, which are really marble. Herodotus records as amongst the presents which were sent to Cambyses the Babylonian King, by the King of Ethiopia, an alabaster box of ointment. Theocritus mentions "gilt alabasters with Syrian ointment." An alabaster of this kind, we learn, was sent to King Alfred by Helias, Patriarch of Jerusalem. The best-known allusion is, of course, the incident of the anointing of Christ by Mary, sister of Lazarus, in the house of Simon the Leper. The "breaking" of the box, related in Mark 14, 3, refers to the breaking of the seal or stopper, for the "box" was a kind of urn or jar. At the present day the term alabaster is used for a quite different stone, crystallized sulphate of lime or gypsum, which is pure white and translucent. For many years alabaster was used in pharmacy, while in various parts of England it is an old custom amongst country people to surreptitiously chip off pieces of alabaster from monuments in churches, for use in plasters for various complaints, the efficacy of the application being attributed to its sacred source.

Crystal is alluded to at various places in the Authorised Version. Job. 28, 17; Ezekiel 1, 22 and in Revelation 4, 6; 21, 11 and 22, 1, in each case the term being used in a symbolical sense. The words in the original Hebrew in Job and Ezekiel are different, and are rendered in the Septuagint by the Greek words *hualos* and *krustallos* respectively, the latter word being the one used in Revelation. There is no doubt that the Krustallos of Theophrastus was ordinary rock crystal or quartz. The Greeks used the word krustallos for ice, and considered that rock crystal was ice congealed, and hardened by fire.

In the New Testament, the word glass, occurs a number of times as the translation of the term *hualos*. Originally the Greek word was used for any clear, transparent stone. "Looking-glasses" are mentioned in several places in the Old Testament, Exod. 38, 8,—"and he made the laver of brass, and the foot of brass, of the looking-glasses of the women," and Job 37, 18,—"Hast thou with him spread out the sky, which is strong, and as a molten looking-glass." While in Isaiah 3, 23 they are amongst the enumerated ornaments of the daughters of Zion. In the Revised Version "mirror" is used instead of "looking-glass" at all these places. In the Apocryphal book Ecclesiasticus 12, 11, we have the sentence—"And thou shalt be unto him as if thou hadst wiped a looking-glass, and thou shalt know that his rust hath not been altogether wiped away. In the New Testament we may refer to 1 Cor. 13, 12,—"But now we see through a glass darkly; but then face to face." 2 Cor. 3, 18,—"But we all, with open face beholding as in a glass the glory of the Lord," and James 1, 23,—"he is like a man beholding his natural face in a glass." In each of these cases the Revised Version given "mirror" instead of glass. There is no doubt that in Bible time the mirrors in use were not of glass, but of polished metal, and this is made quite apparent by the sense of the above quoted texts. I have already referred to the terms in which the expression "glass" is used in Revelation in speaking of the foundations of the New Jerusalem.

Amber, the elektron (from which our word electricity is derived) of the Septuagint and of Theophrastus, is correctly translated in the Authorised Version (Ezekiel 1, 4 and 27 and 8, 2), where the colour of the fire in the prophet's vision is likened to that of amber. In the time of Pliny amber ranked as a valuable ornamental object.

Coral is twice mentioned in the Authorised Version, as a translation of the Hebrew word *râmôth,* Job. 28, 18 and Ezekiel 27, 16, at both places being referred to as an article of value. The literal meaning of the Hebrew word is—"that which grows tall or tree-like," and the object referred to was without doubt the precious Red Coral (*Corallium rubrum*) of the Red Sea, the Gulf of Persia and the Mediterranean.

Pearls are spoken of in Job 28, 18, in the same sense as coral. In the Revised Version the Hebrew word "gabish" in Job is translated "crystal" instead of pearl. The Greek term "margarites" is correctly translated "pearl" in the New Testament. This is confirmed by Theophrastus, who speaks of "margarites" as a precious stone, but not pellucid, brought from India and the shores of the Red Sea, where it is produced in a kind of oyster and in the shell named *Pinna.*

The New Testament references are of course familiar to all of us: the pearl of great price, Matt. 13, 46; pearls before swine, Matt. 7, 6; pearls of costly array, 1 Tim. 2, 9, and the pearly gates of the New Jerusalem—Rev. 21, 21.

The names of a few stones with which I have not dealt, are doubtful; thus the Hebrew word "peninim" which occurs in Job 28, 18; Proverbs 3, 15; 8, 11; 20, 15; 31, 10, and Lamentations 4, 7, is in the Authorised Version translated "rubies," while the Revised Version gives an alternative reading, as "coral," but the Septuagint makes it "precious stones."

A good deal of confusion seems to have crept into the interpretation of the significance of the Hebrew word "bedôlah," which occurs twice in the Old Testament, where it is rendered "bdellium." Gen. 2, 12,—"The gold of that land is good: there is bdellium and the onyx stone"; and Numb. 11, 7, "and the manna was as cariander seed, and the colour thereof as the colour of bdellium." Some authorities have considered that the term meant "an excellent, selected pearl," others that it refers to the beryl. From a careful review of the evidence, I think there can be no doubt that it refers to a fragrant gum resembling myrrh, which was probably used in the ceremonial services as incense. This is the meaning given by both Pliny and Dioscorides, who attach the name to the plant from which the gum was derived.

The Hebrew word "Kadkôd" occurs twice in the Old Testament, where it has been given the same meaning as the word "shebô," and translated "agate." These references are Isa. 54, 12,—"and I will make thy windows of agates," and Ezekiel, 27, 16,—which I have already quoted when speaking of the articles of commerce coming from Syria. The true meaning of the word is very doubtful, and various surmises have been put forward, such as:—ruby, zircon, garnet and tourmaline.

Several other doubtful words could be enumerated, but as no serious significance attaches to their exact meaning, they may be passed over.

In compiling this paper I have derived much assistance from British Museum Special Guide No. 5, 1911, section on minerals by the late Sir L. Fletcher, and have made free use of the very valuable information given there by this most capable author. I am also indebted to "The Curious Lore of Precious Stones, G. F. Kunz, 1913," for a few items.

The lecture was illustrated with a collection comprising specimens of the gem stones and allied objects mentioned, and with large charts showing the tabulated names.

FIFTEEN MINUTES WITH THE AQUARIUM.

In continuance of his plans to popularise the keeping of aquaria by members, Mr. Finckh, at the March, 1921, meeting, gave a number of useful practical details for the guidance of beginners.

He exhibited beautiful living specimens of the Purple Spotted Gudgeon (*Krefftius adspersus*), a fish with which he has been very successful. A strong plea was made for the keeping of our own Australian fish rather than those of other countries, for our own fish are every bit as attractive and in many cases much more so than foreign species which are so much sought after. We in Australia, and especially members of a Natural History Society, should certainly keep and study the habits of our native fish, about which but little is known, instead of dissipating our energy on those of other lands which have already been studied and worked out.

There is a large and extremely interesting field in Australia for this work, and results of value to science can readily be obtained by amateur observers; and would form admirable matter for publication in the *Naturalist*. *Krefftius* is about the only one of which we are in possession of definite data. There are *Pseudomugil signifer, Crassiops compressus, C. galii, Atherine, Galaxias,* Chanda perch, all offering unique opportunities for research and original discoveries.

Many people appear to think that the maintenance of an aquarium is a difficult and troublesome task, and so are afraid to make a start. As a matter of fact, few things are so simple, easy and full of interest. A little practical common sense and very little spare time are all that are required. Five minutes expended every day or even every second day will suffice to keep two or three tanks in the best of order, and if a holiday is taken now and then a well established and good going aquarium, fish and all, will look after themselves for two or three weeks. One of the most important rules is never to put too many fish in one tank, always give them plenty of room.

Mr. Finckh has, by arrangement with Messrs. Farmer, in Pitt Street, installed, in their premises, a most delightful series of tanks with fish complete. A special aquarium has been provided by the firm, decorated in the most artistic manner, with stained glass windows and lovely mural paintings, all of appropriate subjects. The hanging electric lamps modelled on the octopus are themselves works of art.

Any one is at liberty to inspect the collection, which is situated on the fourth floor, Market Street entrance, and we strongly advise our members to avail themselves of the opportunity of seeing this lovely collection.

Messrs. Farmer deserve the greatest appreciation of nature-lovers for their enterprise in affording the public such a unique opportunity of seeing our own native fishes in the most advantageous surroundings.

Many of us were delighted with the beautiful display of stuffed Australian birds and paintings of flowers and birds, and also the groups representing natives of many lands which formed a feature of their windows some time ago. The birds were really wonderful in both grouping and illumination.

The main object of the firm and of Mr. Finckh, in the present enterprise is to make the collection of Australian fishes as complete as possible, and thus afford Australians an opportunity of becoming acquainted with the charming fishes of their own country. We understand that in their larger scheme they intend including marine fishes and other organisms. This will add greatly to the attractiveness of the display.

Ed. *A.N.*

ORDINARY MEETINGS.

March 7th, 1922.—The President, Miss A. A. Brewster, in the chair, and 41 members present. The following were duly elected members:—Misses Rose Carlin, Doreen and A. Black, Messrs. R. H. Anderson, B.Sc. Agric., and F. A. Perkins, B.Sc. Agric. Miss Thistle Harris exhibited some fine specimens which were determined by Mr. Cheel as the "jew's-ear fungus" (*Hirneola polytricha*). Mr. L. Gallard a very fine cluster of a coral-like fungus identified by Mr. Cheel as *Hydnum laciniatum* a rare species in this State, also three species of lepidopterous larvae showing beautiful colouring. Mr. Foster fruiting specimens of *Pittosporum revolutum* and *P. undulatum.* Miss Winsome Hall read notes on "The storage tracheids of stem of *Villarsia.*" Miss McAnene a note on "Cup Moth." Acting Professor Harrison being unable to be present owing to illness, Miss Helen Chase very ably lectured on "The life history of the frog."

April 4th, 1922.—The President, Miss A. A. Brewster, in the chair, and 55 members and friends present. The following were elected members:—Mrs. Jenkins, Miss P. Sigal and Mr. Elliot Reid. The main business of the meeting was a lecture by Mr. G. A. Waterhouse on:—"The experimental breeding of butterflies." The lecture was a most interesting account of Mr. Waterhouse's extensive experiments on the breeding in captivity and crossing of different species of the Satyrine genus *Tisiphone,* in which the lecturer has obtained results of great scientific interest and importance. The lecture was illustrated with a magnificent series of exhibits.

Mr. E. L. Hayes read a note on the occurrence of aboriginal stone implements at Cronulla. Mr. L. Gallard exhibited with notes *Psychopsis mimica* and other entomological specimens. Mr. G. E. Stinson a note on the life history of the Carpet Snake (*Python variegatus*).

New Guinea Seeds.—Specimens illustrating the methods of dispersal of several New Guinea seeds were exhibited by Miss le Plastrier at the May meeting. One of these (*Pithecoctenium*) of the family Bignonia, has a wing diameter of 6 inches. The name *Pithecoctenium* means "monkey comb."

Quaint also are the fruits of *Gyrocarpus asiaticus* where the two upright wings make the fruit into a natural shuttlecock which gyrates to the ground.

The Australian Naturalist

Vol. V. OCTOBER 2, 1922. Part 4.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

May 2nd, 1922. The President, Miss A. A. Brewster, in the chair, and a large attendance of members and visitors.

Mr. T. Steel gave a highly interesting and instructive lecture "On the gem stones of the Bible." The lecture was well received, and much appreciated, showing considerable research in Bible history. The subject was treated systematically the identity of the various gem stones mentioned being carefully traced. It was illustrated with a collection of examples of all the gem stones and allied objects mentioned, and with large tabulated charts. A vote of thanks was proposed by Miss le Plastrier, and seconded by Mr. Finckh, and carried by acclamation.

Mr. L. Gallard exhibited specimens, with comments, of "Mealy bug." Mr. E. H. Zeck, a very fine collection, with notes, of myrmecophilous insects, about 70 species. Miss le Plastrier some striking New Guinea seeds, illustrating mode of distribution. Mr. E. L. Hayes, a living land planarian, which was identified by Mr. Steel as *Bipalium Kewense,* a species first found in one of the glass houses at Kew Gardens, London, to which it had been introduced with plants from abroad.

June 6th, 1922. Miss Brewster, President, in the chair.

Mr. W. W. Froggatt gave a very interesting lecture, "Notes on Charles Darwin and his friends." Although much of the information contained in the lecture was not new, it was, as the lecturer stated, "an old story retold," and evoked much enthusiasm amongst the members, particularly when it was related that many of Darwin's theories had since been established and formed a solid basis for nature students to work upon. A cordial vote of thanks by Mr. Shiress and Miss Saunders was carried by acclamation.

The Hon. Secretary read a note by Mr. McKeown on "Booklice on citrus trees."

Miss McAnene exhibited larvae of *Papileo aegeus,* which Mr. Froggatt said were of interest on account of their pushing out a pair of tentacles which emitted a lemon-like smell.

Miss O'Hara exhibited some fine examples of coral.

July 4th, 1922. Miss le Plastrier, in the chair, and about 44 present.

A paper entitled, "From a Bush Note Book," by Miss F. M. Irby, was read, containing most useful and instructive observations on the habits of a number of bush birds. "Notes on *Antherae eucalypti,*" by Miss May C. Brown, in which interesting details of a case of protracted development was described. Mr. G. Stinson contributed notes of his observations on "Soldier Ants."

Miss H. Butler exhibited a fine specimen of *Cordyceps* from Waterfall, which Mr. Cheel provisionally identified as *C. Gunnii.* Miss C. Black, fossil specimens of *Glossopterus Brownii.* Miss Steinbeck, cup moth (*Limacodidae*).

Owing to the lantern not being available, the lecture by Miss H. Drummond, "A Geological Excursion to Mount Kosciusko," was regretfully postponed to the September meeting.

TENTH ANNUAL MEETING.

August 1st, 1922. The President, Miss A. A. Brewster, F.T.C., presided over the meeting, 60 members and visitors present. The minutes of last annual meeting, Report of Council and Treasurer's statement were read and approved. The office-bearers, as per list on inside cover, were duly declared elected. The retiring President then delivered her address, entitled "The Life History of the Brown Sea-weed (*Phyllospora comosa*)." A hearty vote of thanks, proposed by Mr. E. S. Edwards, M.A., and Mr. G. A. Waterhouse, B.Sc., B.E., and supported by Misses le Plastrier and McAnene, and Messrs. A. A. Hamilton and E. Cheel, was carried enthusiastically by acclamation.

ANNUAL REPORT OF COUNCIL FOR 1921-1922.

On behalf of the Council, I have the honor to submit the 10th annual report of the Society. Eleven ordinary monthly meetings have been held; the attendances showing a considerable improvement to that of the year 1920-1921, the lowest being 32 as against 19 for the previous year, whilst at one meeting there was an attendance of 135.

During the year we have elected 20 new members, which also shows an improvement, as only 17 were elected last year.

The subject matter of the lectures has not only been of special interest to the members, but has dealt with various phases of Nature Study as will be seen by perusal of the following list of subjects:—

Presidential Address. Notes on the Orchids of New South Wales, A. G. Hamilton; Notes on Changing Plant Names, E. Cheel; Wattle-time or Yellow-haired September, A. J. Campbell; Kava and Kava Drinking, T. Steel; Notes on the Weeds of Civilisation, E. Cheel; The Life History of the Frog, Miss H. Chase; Breeding Experiments with Butterflies, G. A. Waterhouse; The Gem Stones of the Bible, T. Steel; Notes on Charles Darwin and his Friends, W. W. Froggatt. An illustrated lecture, A Geological Excursion to Mount Kosciusko, by Miss Heather Drummond had unfortunately to be postponed till September owing to the lantern not being available.

The exhibits at the meetings were liberal and added much to the interest, while the notes concerning them have been instructive and have embraced many branches of Nature Study, including Ethnological exhibits from Ooldea on the Great Western Line, together with butterflies, beetles, scale insects, larvae of various kinds of insects, spiders, shells and live specimens of Gecko. Several geological exhibits, including kerosene shale. Botanical exhibits have included Algae, Lichens Fungi, and quite a number of fresh flowering specimens, as well as a number of dried ones, and coloured drawings of the Angiospermae. To those who have so kindly assisted in giving lectures and in bringing exhibits to the meetings, our sincere thanks are due. Eleven excursions have been held; the localities visited were as follows: Dee Why, Killara, Hornsby, Botanic Gardens, Edwards Bay, Hurlston Agricultural College, Pennant Hills and The Australian Museum. The excursions have been well attended, and useful work has been done in observing the living habits of plants and animals. Our thanks are due to those who have assisted in this important sphere of our work which include Miss Sulman, Miss Brewster, Miss Saunders, Mrs. Fitzjohn, Mr. Steel, Mr. Cheel and Dr. C. Anderson, Director of the Australian Museum, and his staff, and also the Principal of the Hurlston Agricultural College.

Mr. P. D. Murray has been compelled to vacate the position of Librarian for the present owing to his studies taking him to England. For his work in connection with the library we tender him our best thanks, and wish him every success in his studies. Miss Marjory Holland has kindly consented to carry on the work in connection with the library during Mr. Murray's absence.

In addition to the Ordinary Monthly meetings, eleven Council meetings have been held during the year, at which the ordinary routine business has been transacted. The usual four parts of our official journal, "The Australian Naturalist," have been published and issued to our members and other subscribers, as well as to kindred societies and other scientific institutions.

For the services of our Hon. Editor, Mr. T. Steel, who has conducted the journal, the Council offers its best thanks.

The Council has also given consideration to the matter of holding an exhibition of wild flowers and certain groups of our native fauna, with the result that St. James' Hall, in Phillip Street, has been engaged for the 7th and 8th of September, particulars of which have already been furnished to members by circular.

The Council has again to offer its best thanks to Mr. and Mrs. Waterhouse, for their kindness in granting the use of their room in Bull's Chambers, Moore Street, for our Council meetings.

EDWIN CHEEL, Hon. Secretary.

CUP-MOTH LARVA SPINNING COCOON.

By E. McANENE.

Two species kept under observation during March, 1922, probably *Limacodes longerans* and *Doratifera vulnerans*. At 9.20 a.m. a caterpillar of the former species placed in a bottle with piece of twig with leaves, some very fine silken strands noticed. By 9.30 appeared to be biting bark from twig, and at 10.0 was hanging head downwards, holding firmly to twig by anal claspers. The head was bent over the back and moving rapidly attaching silken threads to twig, glass and leaves. Head appears partly withdrawn, body contracted and ventral surface always turned towards light. The caterpillar works rapidly round itself forming the urceolate cocoon, leaving an opening at the wide upper end. At 11.45 cocoon assuming the pear shape and opening now closed. Small ring at apex noticeable, the cocoon now of a whitish colour, resembling the lining membrane of a hen's egg and the caterpillar could be faintly seen working round inside. By 3.30 cocoon completed, firm and assuming a brown shade. The method of work of the second species was similar, but the finished cocoon was somewhat more oval in shape.

BOOK-LICE ON CITRUS TREES.

By Keith McKeown.

During the Spring months a dark-winged book-louse is of common occurrence on the citrus trees on the Murrumbidgee irrigation areas. I have as yet been unable to ascertain the specific name of this curious little insect, but as very little appears to have been published with regard to its habits, or of Psocidae generally, these notes may prove of interest. Mr. Froggatt in his "Australian Insects" simply refers to a book-louse depositing its eggs on orange trees, but does not identify the species or give any further particulars.

The eggs are deposited in large numbers on the leaves, and fruit of citrus trees, and occur in small clusters, each ranging from about six to fifteen olive green or copper coloured eggs, which are large in comparison with the size of the parent. Each group of eggs is covered with a tightly stretched silken sheet of a glassy appearance; through which the enclosed eggs may be clearly seen. Although insects in captivity oviposited freely under observation, I did not observe the spinning of the silken covering sheet, as in confinement the book-lice generally left the eggs open, and made no attempt to cover them in any way—under natural conditions, however, it is exceptional to find the eggs without a more or less complete cover.

The eggs hatch normally in about three to four days. The small larvae are almost colourless, and bear a strong resemblance to minute, newly hatched cockroach larvae, or to a small compressed termite. The antennae are threadlike, and the ocelli which are conspicuous in the adult insect are curiously lacking in the larvae stages. The larvae increase rapidly in size and soon show the well developed wing pads of the nymph, but in other respects changing little in appearance from the larvae stage.

The adult insect possesses well developed wings of a dark smoky colour, and flies with a rather fluttering action, but are normally reluctant to take flight. During the heat of the day they may be seen actively running about over the foliage of the trees. There appear to be several broods in a season, and at any one time specimens may be obtained in all stages from the egg to the adult insect. The insects feed in all stages upon the black smut or Fumagine which is usually present on trees infested with the common Brown Olive Scale (*Licanium olae*) developing profusely on the sticky honey-dew exuded by the scale insect. Under a lense the book-lice may be observed feeding upon the Fumagine, cutting clear swathes in the fungus with their well developed mandibles; the insect moving from side to side of the infested patch of leaf as it feeds. I have reason to believe that the book-lice also feed upon dead and dried scale insects, and possibly on the epidermis of dead leaves, but the Fumagine is without doubt their principal food, and accounts for their presence on the citrus tree. They do no damage to the growing plant.

The habits of these book-lice may be easily observed, the only requirement being a small potted citrus tree fairly heavily infested with Fumagine, leaves bearing egg clusters of the psocids being placed on the soil of the pot, the larvae on hatching readily finding their way to the infested leaves of the small tree, and show little or no tendency to leave the plant, which should, however, be covered with muslin prior to the development of the winged insects. The insects may also be successfully reared in a box by supplying them from time to time with Fumagine-infested leaves.

SOME MYRMECOPHILOUS INSECTS.

By E. H. Zeck.

A collection of some seventy species of these most interesting insects was exhibited by me at the monthly meeting held in May.

The collection contained representatives of the following thirteen families of the *Order* Coleoptera: *Carabidae, Scarabaeidae, Scydmaenidae, Pselaphidae, Staphylinidae, Colydiidae, Ptinidae, Trichopterygidae, Scaphididae, Histeridae, Tretothoracidae, Brenthidae, Xylophylidae,* and also representatives of the following *Orders,* Aptera, Orthoptera, Hymenoptera, Diptera, Homoptera, and Hemiptera.

The following are a few notes on some of the families of the *Order Coleoptera.*

Pselaphidae can be distinguished by their short elytra which leave half or more of the abdominal segments exposed. The tarsi are three jointed, and the antennae are thickened towards the tips. They are small insects, few exceeding 3 mm. in length, and of various shades of brown. In the remarkable species of the genus *Articerus,* the head is elongated, and is much narrower than the thorax; the antennae are apparently one jointed.

Scydmaenidae, which at first sight might be thought to belong to the *Pselaphidae,* can easily be distinguished by their having the elytra entirely covering the abdomen and the tarsi five jointed; the antennae thickened or clubbed at the tips. These insects are similar in colouring to the *Pselaphidae,* but are usually smaller and the elytra more shiny. The largest species of this family taken by me does not exceed 1.5 mm.

Staphylinidae, of various shades of red, brown or black are often found in numbers running actively about the nests. Most species are shiny, and do not exceed 4 mm. in length. The commonest Sydney species being only 1.5 mm.

The family *Trichopterygidae* which contains some of the smallest beetles in the world are represented in the ants' nests by the genus *Rodwayia.* In this genus the eyes are not present. Notwithstanding this they can run most actively about the nests. They are brown in colour, ranging from 0.5 to 1 mm. in length, and closely resembling some species of mites found in ants' nests.

The *Histeridae* are perhaps among the most difficult to collect in the nests owing to their remaining motionless for long periods when disturbed, and in many cases being covered with dust. In the genera *Chlamydopsis, Ectatommiphila* and others, the head can be completely withdrawn into the thorax; the antennae folding into hollows on each side of the head, so that when viewed from the front it presents an almost flat surface. The tarsi fold up into hollows in the tibiae; the legs are then closely adpressed to the body, giving the whole beetle the appearance of a small piece of debris. There is a species to be taken in the Sydney district which can, however, be easily seen when in the nests, its colour being a light reddish yellow. This is *Chlamydopsis epipleuralis,* a species which quickly makes off as soon as disturbed. Length 2.75 mm.

There are two species of *Colydiidae* frequently found, *Nepharis costata* and *Kershawia rugiceps.* Both are dull brown beetles, the former 3 mm. the latter 4 mm. in length.

Ptinidae are represented by a number of remarkable forms having the antennae variable, both in the number of joints and in shape. In colour they vary from black to various shades of brown, and in length from about 4 to 1 mm. or less.

Chlamydopsis epipleuralis was figured by me in the "Australian Naturalist," Vol. IV., pt. 2; pl. II., pp. 20 and 53.

Four species of different genera of the family *Ptinidae* and the genus *Euclarkia* of the family *Colydiidae* will be found figured in the "Australian Zoologist," Vol. I., pt. 8; pl. XIX., p. 245.

FROM A BUSH NOTE BOOK, CASINO.

By F. M. Irby.

In the middle of May we found two nests of the pretty little Red Head (*Aegintha temporalis*) containing eggs. Certainly the Red Head takes little heed of time or season, for I have sometimes found their nests in July and usually there are three or four eggs in a nest, but we once found one with seven. The other finches are equally erratic.

Very large flocks of Chestnut-breasted finch (*Munia castaneithorax*) occasionally come about. Last year we found two of their nests in May, both being in a most unusual position for finches nests, being built amongst the dry hanging leaves half way up the maize stalks in a field of ripe corn. One family was just able to fly, the other only half-hatched.

The Double Bars (*Stictoptera bichenovii*) continue nesting as late in the year; a few mornings ago (May) I saw a family which had just left the nest, huddled on the low bough of a swamp oak, waiting for the small parents to bring food, and I remember at the end of March once finding a nest containing three young, one freshly hatched, and the others almost ready to fly, which they did before the other was feathered. The parent birds attended faithfully to it until it also left the nest.

Have sometimes found the Diamond sparrow (*Stagonopleura guttata*) nests at the end of March. It is curious how this little bird will frequently return to the same place, to build, if not actually to the same bush. I have seen one, when its nest and young had been destroyed by a cat, build again in the same creeper a few weeks later.

The poor little finches have a hard time for their big grass nests are so conspicuous as to be easily seen by their enemies. Perhaps it is on this account that they so often choose the very heart of some prickly shrub or creeper in which to build, such as a cock-spur or wild lime. In the middle west I noticed too the lovely little Zebra finch (*Taeniopygia castanotis*) often built in the wild orange, but even in such thorny places they are not always safe, for I have seen a nest of eggs destroyed by an iguana in the very heat of a wild lime, so thorny that you might well think no living, feeling thing could climb it.

A few days ago I found another belated nest; a part of the creek bank had fallen in carrying with it a number of swamp oaks, and high up in the broken bank a tiny Black headed diamond bird (*Pardalotus melanocephalus*) had dug her tunnel. It was too inaccessible a spot for close investigation, but judging by the way both birds flew back and forth, they must have been feeding the young.

I was surprised to find this nest, for I had never found a Pardalote nesting so late as May before, although this bird is very common here and nests practically anywhere.

The Jacky winter (*Microeca fascinans*) is now arriving, through the warmer months it is unusual to see it here, but it is numerous through the winter and early spring.

Another bird which comes to us in considerable numbers in winter is the little Cuckoo shrike (*Graucalus mentalis*). I have never seen them nesting here, nor have I seen them during the heat of summer, but the Black-faced cuckoo shrike (*G. melanops*) is plentiful all the year round, and its queer flat looking nest is quite common.

On rare occasions during very cold winters we sometimes see a Scarlet breasted robin (*Petroica Leggei*), but in the open forest country you may see a good many Hooded robins (*P. bicolor*) handsome little fellows that sit watching you like miniature Magpies. They remain all the year round.

The Yellow robins (*Eopsaltria australis*) are numerous, keeping mostly to the thick brushes and scrubs, and their beautiful little nests, like cups of moss and lichen, are easily found. Along the creek bank where the foliage is dense, at any time in the year you may be fortunate enough to catch a glimpse of the lovely little Rose-breasted robin (*Erythrodryas rosea*) but it is so quiet and retiring in its habits that it is easily overlooked.

All through the winter the White-shafted fantail (*Rhipidura albiscapa*) is numerous, taking up its abode temporarily in the thick tea tree swamps or about the thickly timbered banks of the creek. All winter it stays in these sheltered retreats, disappearing with the first heat of summer, though a few individuals are always to be seen and an occasional nest found. The Rufus fan-tail (*R. rufifrons*) stays all the while, nesting in the thick shelter by the water.

There is the prettiest little frog to be seen here (but it is comparatively rare) sometimes. If you find one resting upon dark wood it is dark brown mottled with whitish brown and green, so that it might easily pass for a bit of moss-grown wood or a bit of lichen. The inner part of the hind legs is of a deep orange yellow, and the eyes are marked with a black cross. If resting upon light grey wood or soil the main colour is of that hue.*

I was surprised at the numbers of a handsome brown butterfly about just at present. At first I took it to be the Ghost moth (*Melanitis leda*) but soon saw that it was differently shaped, and of a much brighter colouring, while flying it is a handsome reddish brown, but directly it settles with folded wings it so much resembles the colour of the dead leaves that it is almost impossible to distinguish it from its surroundings. Its flight is singularly short, and I have never seen it in the open, it seemingly preferring the dense shade of the bean trees where it flies from clump to clump of the black-stemmed ferns losing its identity as it alights amongst the multitude of leaves. Occasionally too an odd specimen may be seen fluttering about the long rushy grass in the thickest parts of the tea-tree swamp.

EXCURSIONS TO AUSTRALIAN MUSEUM.

June 10th. A party of about 30 members assembled; as this was rather large a number for one guide, a division was made, one section going with Mr. Thorpe, and the other with Mr. E. A. McNeill. Mr. McNeill gave an illustrated survey of the typical Australian animals, pointing out that the greater number of these were marsupials or pouched mammals, that the kangaroos took the place of the deer of other countries, opossums of squirrels, etc. Amongst the most interesting features were the leader's description of the primitive egg-laying mammals or monotremes, the platypus, and the echidna, the former being confined to Australasia. The development and method of nutrition of the marsupials was described lucidly, and was most interesting. Attention was directed to the carnivorous types. The leader then pointed out the main features of the various types of seals and the differences between the turtles and tortoises, and between the dolphins and porpoises. A rapid survey was then made of the lower forms of animal life, such as the corals and sponges. Under Mr. Thorpe's guidance, the other section visited the anthropological part of the Museum. Attention was directed to some very fine examples of geometrical carving on large trunks of trees made by the aboriginals in various parts of Australia. These must have taken much time and labour to execute with the primitive tools used. A large variety of weapons and utensils used for many purposes, both

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*This answers the description of *Hyla phyllochroa*.—Ed.

by the Australian natives and those of numerous South Sea Islands were exhibited and described. The visit was thoroughly enjoyed by the members.

July 8th. On this occasion the party was met by Mr. J. R. Kinghorn, who specialised on the frogs, turtles, lizards, snakes and crocodiles. Many interesting particulars were given on these, one being that there was only one venomous lizard, a native of South America, known to scientists. The difference in the appearance of the bites of harmless and venomous snakes was shown, and the structure of the poison fangs explained; and also the proper treatment of snake bite.

August 5th. A party of about 16 members met at the Museum, and was received by the Director, Dr. Anderson, who conducted the party personally around the exhibits of Australian birds, showing particularly the more characteristic of these. Some curious examples of nests were shown, including some in flower pots, broken bottle, jam-tins, etc.

The final exhibit was a pair of Bosun Birds with a young bird fully fledged, and set up in a special case showing natural surroundings. These birds are from Lord Howe Island, and are named from the resemblance of their note to that of a boatswain's whistle.

Votes of thanks to the conductors were in each case passed by acclamation.

NOTES AND COMMENTS.

Can any member of the Naturalists' Society explain how ants preserve their food in a fresh state? The larger ants, "Soldiers," "Jumpers" (*Myrmecia albo-cincta*), and others live principally on caterpillars, grubs, grasshoppers and other insects.

The working ants never eat the food where caught, but carry it home often over long distances and store it in the nest where it will keep perfectly fresh through a whole season.

It has been stated that they do not kill their victims, but only sting them, thus producing paralysis. This might explain the preservation of live food, but would not apply when the prey is dismembered. I once killed a large snake and threw it on a soldier ant's nest. By the next afternoon I found every particle of flesh had been removed. It was impossible that the ants could have eaten it all in the time, and I have never found any decaying food in their nests. As these insects do not hunt during wet weather a store of food is a necessity.

George Stinson, Taree.

BIPALIUM KEWENSE. At the May meeting Mr. E. L. Hayes exhibited a living example of this interesting land planarian worm. Mr. Steel identified it as above, and gave the following information:—

First discovered in a glass house at Kew Gardens, London, many years ago, to which it had come with plants from some unknown locality abroad, it was named and described by Moseley. Since then it has been recorded from many localities all over the world, and is common in New Zealand, and various parts of Australia. A large number of species of the same genus are found in Ceylon and India. The remarkable feature is the peculiar fan-shaped anterior end, round the margin of which are grouped the so-called "eyes," which can be seen with a lens as dark dots. Like most other land planarians, it feeds upon insects.

PSYCHOPSIS MIMICA. At the April meeting Mr. L. Gallard exhibited a living example of the larva of this interesting insect. This was the sole survivor hatched from a number of eggs laid by adults captured at Albury by Miss Brown, where they flew to a light, and sent to me. Hatched on February 5th, 1921, out of 9 specimens 3 survived till September 23rd, at which date they appeared to be half-grown, two died then. By the end of December this specimen was the largest *Psychopsis* larva I had ever seen. Contrary to my expectation, the larva did not pupate within the Christmas season, and I do not expect it to do so now until next brood season.

L. GALLARD.

Mr. P. D. Murray. We regret to receive the resignation of Mr. P. D. Murray, B.Sc., as honorary librarian. He has been a member of our Society for a number of years, and last year undertook to reorganise the library. Mr. Murray has had a brilliant career at Sydney University, and has gone to Oxford University to do research work in zoology. At a recent meeting, the President (Miss Brewster), on behalf of the members expressed our regret at losing Mr. Murray as an active member, and wished him every success in his future career.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

PRESIDENTIAL ADDRESS.

By Agnes A. Brewster.

Delivered August 1, 1922.

Before giving my address I propose to give a few impressions of the Society viewed from the broader standpoint of President. The outlook seems very encouraging. After the great depression of the active interests of the Society during the Great War, the Society is gradually getting back to its normal condition. Old faces are seen here again, and there are many new members, some of whom give promise to become active members, and so keep up the supply of leaders and councillors. As Mr. A. A. Hamilton so strongly urged in his Presidential Address some years ago (Aust. Nat. III., p. 212, 1917) there must be the working up of younger members to take the place of older leaders, who often have to give most of their time and energy to wider fields. Thus, it has been most gratifying to see in the Journal, papers by Miss Heather Drummond, and Miss Hilda Butler: the writing up of an excursion by Miss Thistle Harris; the acceptance of the position of Librarian by Miss Marjorie Holland, B.Sc., and the lecture given before the Society by Miss Heather Drummond. In experimental work I might mention specially Miss Siegal, who is studying the Lepidoptera, and Miss Rose Winter, whose papers on "Slaters" and "Geckos" were a delight, for they showed patient and steady work, combined with accurate records. It is rather a pity more members do not engage in experimental work for there is often a fresh observation made, even when the general life history has been already worked out. Often valuable natural history knowledge is spread by exhibits, and Misses Steinbeck, Le Plastrier, McAnene, Ashton, and Mrs. Haussmann have given us some very good ones; while Mr. Gallard, Mr. Zeck and Mr. Watson have supported the Entomological side by valuable and uncommon exhibits.

It is often only by chance that one hears of the experimental work such as the propagation of native plants engaged in by Messrs. Duckwork. It would be interesting to have a comparison of their results with those obtained by Mr. Shiress, whose propagation by "cuttings" has been so successful.

A pleasing feature is to see young people who have seriously entered the fields of science still supporting the Society by notes and exhibits, among such being Mr. Hamblin, B.Sc., and Mr. Pat. Murray, B.Sc.

We have to thank some of our country members for very interesting notes and exhibits sent down to our meetings. The Rev. Archdeacon Haviland, Miss Florence Irby and Mr. Larcombe have helped in this way.

Mr. Foster's exhibit of very fine paintings of species of various families of native flowers has been a big support to the botanical section.

It is very good to have Mr. and Mrs. Parry with us again after their stay in the "Old Country." I wish to thank Mr. Parry for his enthusiastic interest in the excursions during the year, and for the writing up of the interesting series of visits to the Museum during the winter months.

I beg to thank the members of Council and Society for support and sympathy during my Presidential year. I am indebted to our indefatigable Hon. Secretary, Mr. Cheel, for his help in meetings and excursions; also Mr. A. A. Hamilton for help at our meetings, and Mr. Steel, our Editor, for his lectures and excursion.

Finally, I must thank you again for the honour you conferred on me in electing me to the position of President during our last Society year.

LIFE HISTORY OF PHYLLOSPORA COMOSA.

The Algae form a class of the Phylum Thallophyta, and this large group comprises plants which have simple structures and show no differentiation into roots, stems and leaves. Some of the Algae consist of only one simple cell, and this plant performs the physiological and biological functions of respiration, photosynthesis, assimilation and reproduction. But the sea weeds are Algae much more advanced. They are multicellular, and though they do not bear true roots, stems or leaves, they show marked differentiation of structures similar in outward form to stems and leaves.

Sea weeds can be divided into three zones, according to their habitat. (1) The green sea weeds in the upper area of the tidal strand; (2) brown sea weeds lower down, and (3) red sea weeds in the lower reaches. Of course there is no strict demarcation between the zones, for the brown bead-sea weed (*Hormosira*) is found in the highest rock pools.

The "giant" forms of Algae are found among the brown sea weeds.

I will take *Phyllospora comosa* (Plate 1) as a type. Harvey, in "Phycologia Australica," gives a general description of this Alga, and records that it is found only in the South Seas.

Morphological Structures.—The *Hold fast* (Plate I. Fig. 1. a.) or so called *roots.* This is formed of a number of short root-like processes which become very strongly attached to the medium on which the plant is to live. Dr. Bower records of *Fucus,* the growth and fusion of a number of slender filaments, each of which becomes attached separately to the rock, etc., and then fuse later to form one of the strong root-like branches of the hold fast.

Next is the basal stem structure (Plate I. Fig. 1. b.) which is thick, tough and almost round in cross section; it divides later into flatter branches bearing leaf-like appendages. Dr. Bower records of *Fucus* that the stems are developed from the leaf-like, first growth of the thallus, by the rapid growth of the central mid-rib part, while in the flatter edges, growth ceases and in time the mid-rib area becomes thick and strong, while the thinner peripheral zone is worn off, and this can be observed in *Phyllospora.* Some of the leaf-like appendages are modified to form *"fruiting leaves"* (Plate I. Fig. 4.) bearing, on separate plants, male or female reproductive organs. Other branches are completely modified to form large elliptical hollow "floats" (Plate I. Fig. 1. c.). This dividing up and modifying of the general thallus shows a successful development enabling the plant to spread out and float in the water so that the light needed for all its energies can be obtained.

Light plays an important part in the development of plants and is necessary for all self-supporting plants. For the energy yielded by light rays entering certain cells is used to make the green pigment *Chlorophyll*: then this pigment has the power to arrest additional rays of light and this captured energy is used for the physiological processes of the plant, the chief of which is the manufacture of food or Photosynthesis, this first food being a carbohydrate such as starch or sugar, and this carbohydrate food with stored energy is the foundation for all the other foods made, and hence for the building up of and repairing of plant cells and tissues.

Thus a plant strives to get the best position for light suitable to itself, and in doing so very gradually evolves more complex tissues, which are necessary for erect positions, etc.

A more elongate type of thallus is evolved with the strengthening up of groups of cells, etc., and so tissues are formed, often with specialised cells.

Phyllospora belongs to the group of sea weeds called *Phaeophyceae* or brown plants, the colour being due either to a pigment which masks the green chlorophyll or to one pigment called *"phaeophyll,"* which is similar in function to chlorophyll, and is easily converted into it. (Molisch).

I placed segments of the thallus of *Phyllospora* in weak solution of formalin, and got a brownish solution after a day. The same segments were then placed in 70 % alcohol, and the clear green colour was shown in the solution after standing an hour.

MICROSCOPIC WORK. Section thallus (Plate II. Fig. 1.)

The section of a leaf-like branch of the thallus showed three well marked zones. (1) *Cortex.* (Plate II. Fig. 1. a.), with pigmented cells where photosynthesis take place. The outermost row of such cells are palisade-like, and are followed by small rounded cells which gradually get larger and paler in colour till they merge into (2), the *Medulla* (Fig. 1. b.), a colourless area with large cells forming a padding-tissue for (3) *Conceptacles* (Fig. 1. c.); the medulla also is a conduction and storage tissue for foods. (4): *Mid-rib tissue*: (Fig. 1. d.) there is a distinctly marked band of thickened small cells with thick gelatinous swollen walls and small lumen. Nearly all the cell walls have a swollen appearance. A mucilaginous sheath seems to cover the branches of the plant which gives the branches a smooth surface and allows free, easy movement of segments over each other in the waves.

The Fruiting "leaves" (Plate I. Fig. 4). On certain leaf-like branches of the Alga, a series of elongate elliptical swellings can be seen, and if a lens be used, a little opening or *ostiole* (Plate I. Fig. 3. a.) can be seen. This opening leads into a flask-shaped cavity (in cross section) which is embedded in the general tissue. This cavity is called a *Conceptacle* or *Scaphidium.*

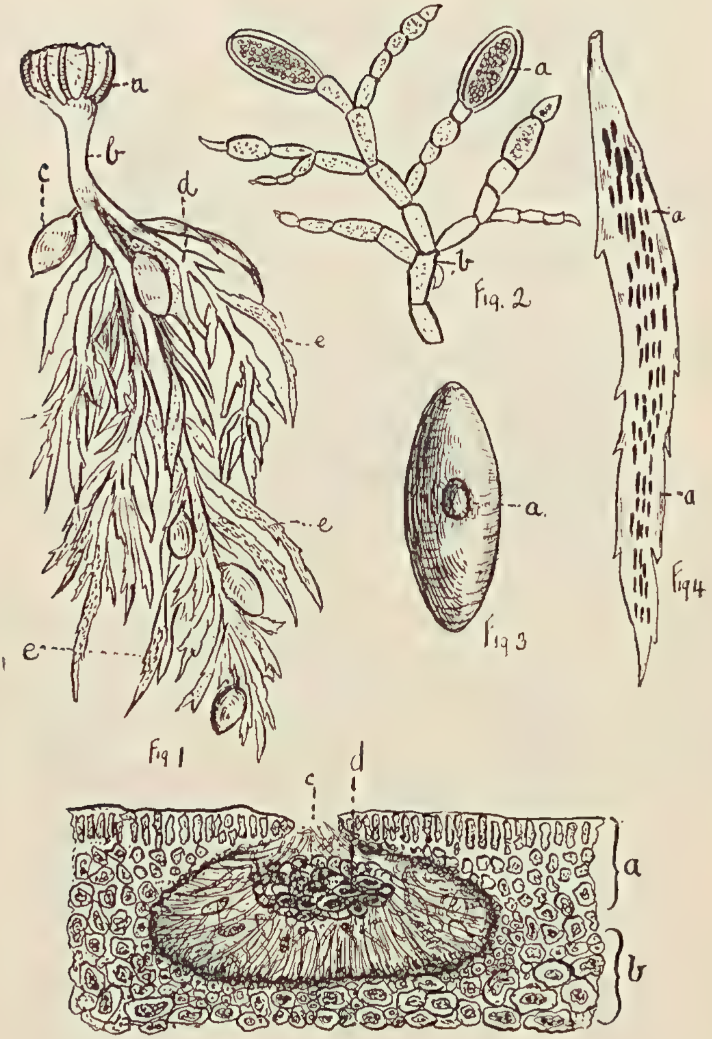

Fig 5

Plate I.

There are male and female conceptacles, each on different plants (dioecious).

The *female branch.* If a cross section of branch be made the following structures can be seen (Plate II. Figs. 1, 2, 3, 4) (a), the sterile hairs or *paraphyses* consisting of hair-like multicellular bodies, either simple or slightly branched. (b) *oogonia* or egg holders, rounded bodies fixed to the wall of the conceptacle by a single cell. The wall of the oogonium consists of two distinct walls, the mucilaginous outer one swelling and still enclosing the inner wall. The ovum or egg cell of granular pigmented protoplasm is large and elliptical. I found no trace of permanent division of this protoplasmic mass. In one case the egg cell had become nearly completely divided into 2 lobes by pressure, and when the latter was removed the granular protoplasm flowed from one to the other lobe and resumed the rounded elliptical form.

THE MALE CONCEPTACLE. (Plate I. Fig. 3, 4, 5.)

The male conceptacles were slighter, narrower and smaller than the female, but in a general way similar. However, the paraphyses (Plate I. Fig. 2.) were very numerously branched, with swollen segments, and on some of the branches were the elongate elliptical *antheridia* (Plate I. Fig. 2). In most conceptacles they were shed, and formed a dense mass in the centre of the conceptacle. These would be expelled through the ostiole, and on reaching the sea water would burst and set free numerous minute *antherozoids* or fertilising cells, one of which would unite with the oosphere or egg cell, and by subsequent cell division and fusion of cells a new *Phyllospora* plant would be built up.

DESCRIPTION OF PLATES.

Plate I.

Phyllospora comosa. (Male).

Fig. 1. a. Holdfast. b. Main Trunk. c. Float. d. Branch. e. Male "fruiting leaves."

Fig. 2. Microscopic view of one of the paraphyses. a. Antheridium. b. Compound paraphysis.

Fig. 3. Conceptacle (seen with lens). a. Ostiole.

Fig. 4. Male "leaf." a. Conceptacles.

Fig. 5. Longitudinal section of a conceptacle. a. Cortex. b. Medulla. c. Ostiole. d. Antheridia clustered in centre.

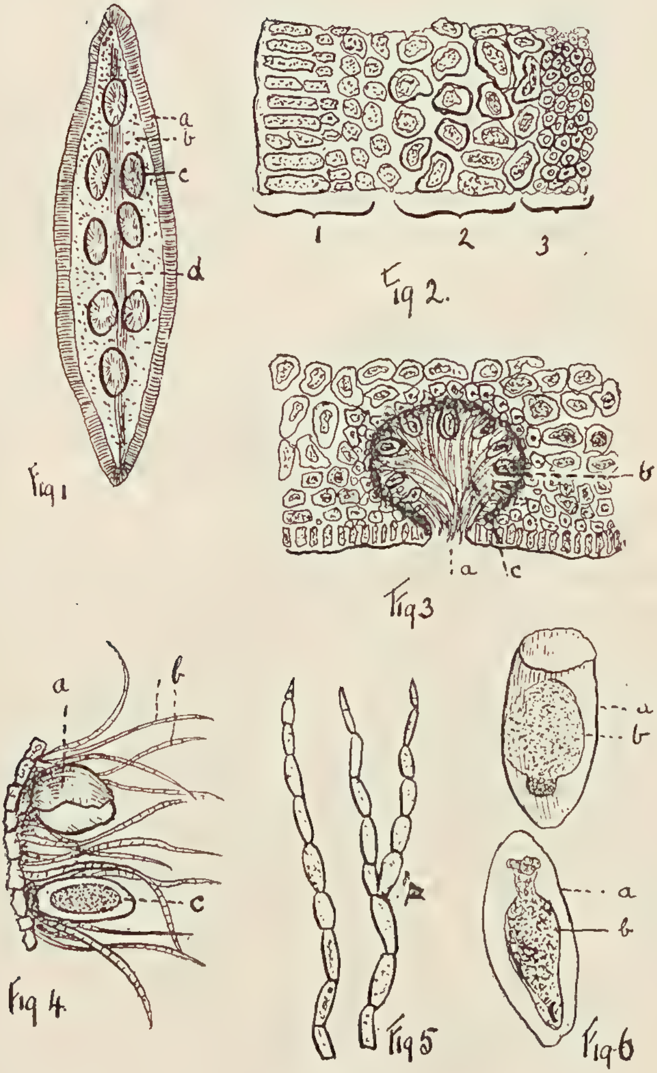

Plate II.

Plate II.

Microsocópic sections and views of parts of female "leaf."

Fig. 1. Section of "leaf" (low power). a. Cortex. b. Medulla. c. Conceptacle. d. Rudimentary "mid-rib."

Fig. 2. Same seen with high power. 1. Cortex. 2. Medulla. 3. Mid-rib.

Fig. 3. Cross section of conceptacle (low power). a. Ostiole. b. Oogonium. c. Paraphyses.

Fig. 4. View of young oogonium with paraphyses. a. Outer shell of oogonium. b. Paraphyses. c. Young oogonium with egg cell.

Fig. 5. Paraphyses (high power).

Fig. 6. Oogonium (high power).

PSEUDO FULGURITES.

By Thistle Harris.

The specimens exhibited (at September meeting) were collected on the side of a sand dune at Deewhy where they occur in abundance. True fulgurites were exhibited before the Society last year by Miss Heather Drummond (Aust. Nat. V. p. 30) these being formed through lightning striking the sand and forming a fused siliceous tube.

The pseudo fulgurites have an entirely different origin, being formed by accretion of calcareous grains round the roots of plants. The roots of plants evolve carbon dioxide, which in the presence of water partially dissolves the carbonate of lime of shell fragments present, and causes these to adhere together round the roots, thus forming rough tube-like structures, which remain after the decay of the roots. These calcareous tubes are frequently of irregular shapes following the erratic course of the roots.

FOSSILS IN THE NARRABEEN SHALE.

By Thistle Harris.

Practically all the shale along the coast at Narrabeen is packed full of plant, and possibly insect, remains. Many of these fossils are imperfect and difficult of identification, while numerous specimens formerly good have perished through weathering. Excellent stems of calamites, mostly *Phlyllotheca,* whose living representatives are seen in the horsetail (*Equisetum*), have been found here, and as they may measure as much as 4 or 5 inches across, the plants themselves must have been of considerable size. The modern equisetum, the sole living genus, is quite a moderate sized plant.

In the fossils the ribbed structure of the stem is well marked, and the division into nodes and internodes may be clearly seen. The whorl of leaves which occurs at the nodes and which is comparatively small, when found in the fossil state is known as *Annularia.*

Perhaps the next commonest fossil of the Narrabeen beds is *Thinnfeldia,* in appearance closely resembling a modern fern. This had feathery pinnules, and was of considerable size. The specimen exhibited shows the branching and general mode of growth very well. It was identified by Miss Brewster as *T. odontopteroides.* Other plant remains occur including the ferns *Taeniopteris* and *Macrotaeniopteris.*

THE COCOON OF THE CUP MOTH.

By C. A. Steinbeck.

In order to ascertain how the larva of the Cup Moth obtains a "lid" to its cocoon, I have watched the spinning of three cocoons with the following result: The larva commences by spinning web enough to cover half its length; it then doubles itself completely backwards, and in this manner draws the remainder of its body into the web. In this position (head and tail segments touching) the larva completes the whole spinning process; the cocoon constantly varying in shape with the many turnings of the doubled-up caterpillar, as it spins rapidly and continuously for four and a half hours. When the spinning ends, the head and tail segments are always at the base, and this gives the cocoon its well-known shape. The larva now ejects a considerable amount of milky-white fluid on one side of base, and this is spread up the corresponding side of the cocoon by violent contractions and extensions of the body. A second quantity of the fluid is then ejected at the opposite side of the base, and is worked up the other half of cocoon in similar manner. Owing to the forcing of the body against the apex (after each contraction) very little, if any, of the fluid can enter the extremity of same, and hence there is always a brown circular patch or ring to be found (marking what might be termed the "high-water" mark of the fluid), and thus a line of least resistance is formed at which, naturally, the apex comes off in lid-like fashion at the emerging of the moth.

Finally the larva—now a wrinkled object and reduced to half its size—makes its way head first till it reaches the apex where it remains in readiness to pupate. Truly a wonderful illustration of instinct.

Of the three larvae (*Doratifera*) under observation, two attached themselves to the lid of a box and neck of a bottle respectively, but the third chose the twig of a brush-box tree, and before commencing to spin, bit away one-third of an inch of the bark and into the wood, thus doubling the time taken by the others. Of eight cocoons I have taken from trees, all have been attached in manner described, evidently for the purpose of fitting the cocoon into a groove and hence strengthening its foundation.

In addition to several trees in the bush, I have seen these larvae in considerable numbers on guava and apricot trees, hence it is evident that they acquire tastes with facility, and, unless checked, may prove yet another pest in the orchard.

A FEW OBSERVATIONS ON TRAP-DOOR SPIDERS.

By Rose M. Winter.

These observations on the common brown Trap-Door Spider were made during the past two weeks to 6th March, 1922. The spider's holes occur in a "chip" tennis court at North Sydney.

In the forenoon of a hot day the holes all seemed to have the doors beside them, and in most cases the spiders were lurking just inside the top of the hole. Passing the hole simply made the spiders hastily retire into the darkness, but pounding the earth a few yards from the hole with a mallet made them put the trap-doors over the entrance. The method of putting on the door is as follows:—The door (or lid) lies just beside the hole with the underneath and slightly concave side uppermost. With the front pair of legs the spider grasps this slightly concave surface of the door and pulls. The second pair of legs are placed against the edge of the door nearest the hole to prevent it sliding; the remaining pairs of legs are inside the hole and with them he obtains a purchase for the pull, so that the spider is only about half out of the hole. The door comes over and down as quickly and as smoothly as if on hinges with a patent stop to prevent slamming.

About noon the lid of one of the spiders' holes was taken away and placed about 4 inches from the hole. The next morning the lid was in its right position, covering the hole. About 5 or 5.30 p.m. on another day when the spiders seemed to be closing up their holes for the night, some rather mean tricks were played on several of them. The doors were taken off four or five holes and the spiders replaced them within two to ten minutes; the smallest spiders seeming to take the minimum, and the largest the maximum time. In the case of most of the holes this was repeated. Then two small holes close together were selected; in the case of No. 1, after I had twice removed the lid and he had replaced it, I again took it off and this time placed it about 1 inch from the hole, upside down, that is, in the wrong position for turning over into the hole. As this was a very small spider, the distance was about 8 times the diameter of the hole. In a few minutes he came up again, facing the point where the door should have been, and reached for it. Not finding it he made a complete circuit of the hole with his front legs reaching out. He then retired to the hole and in a few minutes made another circuit, reaching further out this time, but starting in exactly the same position. He went back into the hole and then reappeared, this time to make another complete circuit, reaching as far as he could, with only one leg remaining in the hole. Then he went back into the hole, and in the darkness evidently screwed up his courage for a final effort; on his re-appearance he sallied forth hurriedly from the hole, going about an inch away and just missing the lid. Three times again he went back and sallied forth, each time choosing a different quadrant of the circle surrounding the hole to explore. The last time, having come almost to the position of his first expedition, he discovered the lid, seized it hurriedly and dragged it quickly, as it was, to the side of the hole. Here he let it go and got inside the hole, quickly took up his position for closing and pulled the door down; as he had not turned the lid over at all it was wrong side up, and showed the slightly concave, smooth inner surface instead of the rougher surface which matched the surroundings. Later on this lid was taken off again and placed beside the hole in the wrong position, and he again pulled it over, but did not alter it.

In the case of No. 2 (a slightly larger spider), the lid was taken off and put just beside the hole, but wrong side up. He came up and pulled it over, still wrong side up, just as the first spider had done, but after a few knocks and pushings from inside to settle it in position, the door was completely turned over and was now in its normal position. The same experiment was repeated a few minutes later with exactly the same result.

MUCILAGE CELLS AND RAPHIDES OF HIBBERTIA.

By A. A. Brewster, F.T.C.

The genus *Hibbertia* belongs to the family Dilleniaceae, and is a typical xerophyte. In most species the leaves are small, and in the beach growing *H. volubilis* the leaves are larger, but with upper bright surface, and the lower clothed with hairs. As the name denotes, it is a twining plant. A marked feature of all parts of the internal structure of the Hibbertias is the presence of crystals of oxalate of lime, called raphides, which are needle shaped and usually occur in bundles like faggots. The beautiful yellow petals are worth studying. First there are the curious deeply lobed cells, giving an increased surface of the protoplasm and hence more working power. Then there are the chromoplasts or yellow grains of protoplasm which give the colour to the petals. Finally there are curious elongate sac-shaped mucilage cells which are capable of absorbing and storing relatively large quantities of water. Within these sacs are bundles of raphides which are secreted to get rid of the injurious oxalic acid—a waste metabolic product—by fixing it with calcium and so rendering it innocuous.

EXCURSIONS TO PENNANT HILLS.

May 6th. On arriving at Pennant Hills we were at once struck with the ecological aspect—the contrast of the growth—on the shale area (Wianamatta shale) where the land yielded tall eucalyptus trees and shrubs. Further on we got on to sandy patches where Banksias, Hakea, etc., flourished. The leaders pointed out various interesting types as we passed down the creek—which is on the west side of the railway line, about a mile from the station, turning to the right at the far end of Stephens Street. The entomologists, with Mr. Gallard, found ample material in the creek pools. Mr. Steel had on view living examples of the frog *Hyla phyllochroa* which is not uncommon about his garden. The leaders were Mrs. Fitz-John and Mr. Steel, and "billy tea" and cups, etc., were kindly provided by Mrs. Steel, water being carried down from Mr. Steel's house, near the creek, that in the latter not being suitable for drinking. The excursion was very successful and interesting.

A. A. Brewster.

The party was met at the station by the leaders, Mrs. Fitz-John and Mr. Steel. After a few minutes walk we reached Mr. Steel's residence, where we gathered up the "billies" of water and provisions kindly provided by Mr. and Mrs. Steel. At the entrance to the gully Mr. Gallard showed in a small swamp oak the presence of a cryptophaga moth larva which was exposed by splitting the branches in which it was boring. These larvae leave their burrows at night to feed on leaves and have a habit of cutting off fresh leaves and sticking them in the felted covering of the burrow. Fresh examples of these were noted. At the next turn on the left we entered the gully proper, where the President (Miss Brewster), who was in charge of the Botanical section, found ourselves surrounded with specimens of botanic interest. Some of the bush plants, notably the Banksias, were in full bloom, and rendered the beautiful little gully extremely attractive, but the most important point from a botanical view was the possibilities of the place for another visit later on in the flowering season.

Mrs. Fitz-John had taken a little dredging net and with this many most interesting specimens were secured from the rock pools. These comprised numbers of dragon fly larvae of different species, *Chauliodes* larvae and also that of *Sialis lutaria*, all of which were identified by Mr. Gallard and numerous specimens secured. Our old artist friend, Mr. Foster, was present, and collected plenty of material for artistic use. At the approach of 5 o'clock the party had reluctantly to leave the delightful little gully, and at Mr. Steel's gate the thanks of the excursionists to Mr. and Mrs. Steel, and Mrs. Fitz-John for so pleasant and profitable an outing, were expressed by the President.

L. Gallard.

November 11th. It was a merry party of "Nat's." that arrived at the Pennant Hills station in the early afternoon of November 11th, and, led by Mr. Steel and Mr. Gallard, struck out for the bush. It was not long before the haunts of men were left behind, and the bush spread her treasures for would-be botanist and entomologist alike. Near a tiny streamlet we were delighted to find the Red Bottlebrush (*Callistemon lanceolatus*), 8 to 10 ft. high, in full bloom, and the slopes of the gully looked snow-flecked, so thick were the flowering tea trees (*Leptospermum flavescens*). A green flat handy to the creek having been reached, we were glad to "down luggage" and prepare for collecting. Mr. Gallard showed his insect-collecting apparatus for an excursion of this kind and demonstrated its use. The party then split up, the flower lovers scouring the slopes, while the entomologists dragged the ponds for aquatic larvae. Four different species of Dragonfly and one of Tipulid larvae were captured, also specimens of *Dytiscus, Gyrinidae* and Notonectidae. Other specimens included Mydaid and Asalid fly larvae, a Carib beetle and Ant lions. Mr. Gallard exhibited some peculiar fly larvae found during the week in rotting wood at the top of a decayed tree, which he explained were intermediate between the Tipulid and Tabanid types of fly larvae.

Included among the flowers collected were *Tetratheca pilosa* var. *denticulata, Scaevola hispida, Goodenia heterophila, Leptospermum stellatum, Grevillea sericea, Helichrysum diosmifolia, Lasipetalum ferrugineum,* etc.

Mr. Steel showed a couple of aboriginal stone axes which he had found close to his house.

We have to thank Mr. and Mrs. Steel for their thoughtfulness and generosity in providing for us all such a delicious cup of real billy tea, and ample provisions. After we had shown our practical appreciation of the afternoon tea, Mrs. Steel led us to the deserted quarry, where flannel flowers grew in abundance. On a tall gum near the quarry several of us were fortunate enough to see a White shafted Fantail feeding two almost full grown youngsters, and throughout the afternoon bird notes could be heard, two of the songsters being identified as the Grey Shrike Thrush and the Rufous Breasted Whistler. Altogether a most enjoyable and interesting excursion.

ROSE M. WINTER.

The excursion on 6th May, although the weather was beginning to get cold, yielded some good results, the locality being admirably suited for the collection of botanical, entomological and aquatic specimens. The party made the "picnic ground" their headquarters. Plants in bloom included *Bossioea, Pimelea, Crowea, Wahlenbergia, Leucopogon, Grevillea, Banksia* and several species of *Acacia*. The creek was of great interest to some of the party, many water creatures being secured, including *Notonecta*, gyrinid beetles, water-striders, some fine dragonfly larvae, caddis flies, fresh water shrimps and a fine crayfish, dark green, mottled with red.

On November 11th a very enjoyable afternoon was spent at the same place, there being some 31 members present. The glory of the early spring flowers was past, and a good deal of destruction had resulted from a severe bush fire earlier in the week, yet a goodly collection remained.

Some fine bunches of flannel flowers (*Actinotus helianthi*) were obtained, *Callistemon lanceolatus* was a glorious sight, as also were many of the following:—*Melaleuca cricifolia* and *M. styphelioides, Pultenaea, Dampiera, Goodenia, Bauera, Dillwynia, Boronia, Tetratheca* and others. Aquatic specimens included Dragonfly and tipulid larvae, the water scorpion (*Nepidae*) and many others.

Ada J. Fitz-John.

EXCURSION TO BALGOWLAH.

Under the leadership of Mr. E. Cheel a party of enthusiasts met at North Sydney on the 7th October bound for Balgowlah, via The Spit.

As our tram wends its way along we read the history of the progress of this part of Sydney. We see the homes of a past generation, which have stood the test of time-congested old timers; we pass rows of modern shops; and further on we see modern bungalows, and, with their advent comes a fresher, a cleaner atmosphere, and a sense of freedom not to be found in the congested areas. Then as the tram winds down to its destination glorious vistas of the harbour nestling under the shadow of the hills greet our eyes. On its waters are the white sailed craft so familiar to us.

Then our attention is drawn to the incoming punt which is to carry us to the farther shore. Maybe our minds go forward to a future day when this obselete mode of transport will be a thing of the past, and a fine span of bridge will grace these shores. However, at last we set foot on the opposite shore where we add a few more to our party. This brings our number up to about 20.

We scramble into the tram, which seems to be in a hurry, for it soon wends its way up the steep mountain side richly covered with luxuriant flora. *Hakea dactyloides* with its mass of creamy flowers invites our notice, *Grevillea linearis* graces the landscape, *Dampiera stricta* gives a splash of blue, *Epacris longiflora* thrives in its craggy home, while *Epacris microphylla* in its white raiment loves the moisture.

Suddenly we are reminded that we are to alight, so we follow our leader away to the left, and soon find ourselves in Nature's garden. A carpet of low-growing flowers stretches before us. They represent many colours, forms, sizes, families and genera. Lavishly has Nature painted our bush; and we who came to learn something of their habits of life were not disappointed—our leader explained away our difficulties.

We gathered the following list of flowers which includes 34 genera:—

Grevillea buxifolia, G. punicea, G. linearis, Conospermum ericifolia, Isopogon anethifolius, Epacris microphylla, E. obtusifolia, Styphelia triflora, Leucopogon microphyllus, Philotheca australis, Phebalium dentatum, P. lepidotus, Boronia pinnata, Pultenaea stipularis, P. flexilis, Dillwynia floribunda, D. ericifolia, Viminaria denudata, Mirbelia reticulata, Platylobium formosum, Stylidium lineare, Gardenia stelligera, Dampiera stricta, Kunzea capitata, Calythrix tetragona, Darwinia facicularis, Leptospermum stellatum var. *grandiflorum, L. parvifolium, Burchardia umbellatum, Sowerbaea juncea, Stypandra* sp., *Hibbertia fasciculata, Pittosporum revolutum, Billardiera scandens, Tetratheca cricifolia, T. pilosa* var. *denticulata, Diuris maculata, Bauera rubioides, Callicoma serratifolia, Mitrasacme polymorpha, Ricinocarpus pinifolius, Xerotes* sp.

Our leader drew our attention to some noteworthy types such as *Kunzea capitata* and *Grevillea buxifolia,* the former receiving its specific name from its cap-like arrangement and the latter from its box-shaped leaves. Then, again, we studied the pultenaea and learned to distinguish it from the dillwynia by its bracteoles. Our attention, too, was drawn to the fact that it was necessary to know more than the names of the flowers; it was necessary to learn how to distinguish one genus from another. Many other things of interest were explained to us, but space will not permit their inclusion.

Laden with flowers we turned our footsteps homewards, having spent an instructive and enjoyable outing, thanks to our leader, Mr. E. Cheel.

H. M. Crispo.

NOTES ON THE CARPET SNAKE.

By George E. Stinson.

The Carpet snake (*Python variegata*) begins life under the handicap of a bad name for which, like a good many other harmless creatures, he frequently pays the penalty of his life. Though he sometimes visits the settler's fowl-house his good deeds in other directions far outweigh his bad ones.

It is a mystery to many how he, being so slow, can capture the swiftest animals. The writer is convinced that he catches them asleep, guided to his prey by his unerring scent.

A party of shooters once raided a flying-fox camp near Krambach (on the North Coast), and during the attack saw a very large carpet snake among the branches of a brushwood tree. They shot at him until he fell, and on opening him they found five foxes freshly swallowed—others in different stages of digestion, and more than thirty skulls of others previously digested. The settlers then realised that they had murdered a friend.

The writer and a mate, one morning came across a carpet snake which had commenced to swallow a grey wallaby—the snake was a big fellow—about twelve feet long. The wallaby a half-grown one. The animal was crushed into a shapeless mass. The snake had the head and shoulders in his mouth. We visited him morning and evening, but he would never work while we watched. Still the wallaby was slowly but surely disappearing, and at the end of five days the meal was finished, and the snake went peacefully to sleep.

The mouth of the carpet snake has two complete sets of jawbones and double rows of teeth. The jawbones are movable and are not joined at the front, so that his mouth can expand to almost any width, as by the action of the jaws the mass is forced down the throat.

The strength of the snake is wonderful. Once the writer and a brother came across the tail of a big fellow hanging out of a hole in a log, and started to pull; we could stretch him about a foot, and then he would contract again and all the time we both pulling our hardest. He was stronger than the two of us, and we were pretty hefty fellows at that time. At last something in the log gave way, and he came out by the run. He did not seem a bit annoyed, so we left him at that.

Although the snake has a voracious appetite and a wonderful digestion, he can outfast Dr. Tanner. A gentleman in the Manning River district, once caught a carpet snake, and confined it in a large cage. Tempting morsels such as live rats, pigeons, etc., were offered, but refused. He died at the end of nine months, having eaten nothing during that time.

So far as the experience of the writer goes all venomous snakes are born alive—the eggs being hatched in the body of the parent, while non-venomous—such as the carpet, lay the eggs.

The carpet snake lays from thirty to forty eggs—all connected like sausages by a skin. A calabash on a tree is a favourite nesting place. The mother snake is always in attendance. The time required for incubation I don't know.

All other snakes known to the writer with the exception of the deadly "bandy-bandy" are generally daylight travellers. But day or night is all one to the carpet snake. He does not, however, travel very far at any time. If the blacks—in the old days when there were blacks about—saw one and did not happen to want it just then they would go back days afterwards and get it. They would say "That pfellow sit down that place" (he lives there).

Although this snake is such a sleepy fellow he can put up a terrible fight when attacked. For though not venomous yet with his enormous jaws and double rows of long hooked teeth he gives a severe bite. And when he gets a hold never thinks of letting go. The gamest bush dog will decline the scrap single handed. There are many tall stories told of the size of snakes, some claiming to have seen carpet snakes up to eighteen and even to twenty feet in length. But the largest the writer ever met with during more than half a century's experience in the bush was thirteen and a half feet.

All snakes are said to grow larger in North Queensland than with us.

The carpet snake would be a very useful resident in rabbit-infested country could he be induced to settle there as the burrows would be no protection from him, and half-a-dozen bunnies would just about make a nice breakfast for him.

NOTES AND COMMENTS.

Some brilliant insects. At the March meeting Mr. L. Gallard exhibited three species of lepidoptera to show their bright colouration. *Agirista agricola,* which is closely allied to our common grape caterpillar, and is one of our most beautiful day moths. The larvae feed on different wild vines in the Gosford district.

CHIRAGA SPLENDENS. A mounted specimen of the female, which is about two inches across the expanded wings. The body and hind wings are salmon coloured, and the front pair are a mixture of green and dark salmon, showing a nice pattern. A larva and pupa were exhibited in spirits. The pupa was of the male sex, which when fully matured is a lovely green moth with a wing expanse of about 1½ inches. In this case the fore wings are ornamented with two bright silver bars, which form a great contrast in colours. These white bars could be seen very distinctly on the wing pads of the pupa exhibited. *Euploea corinna.* Two pupae in spirits. In this case the metallic tints were beautiful, as the spirits seemed to bring out all the bright sheens characteristic of this family.

ACACIA ELONGATA. I have a plant of this wattle in my garden which has been literally covered with bloom for the past two seasons, and which has not set any seed as yet, but to my surprise I find that it is spreading by means of underground stems. There are now three young plants about two yards from the parent, and which show the pinnate leaves just as a seedling would. We know that certain acacias have this habit, notably Mr. Cheel's *A. intertexta* which travels for long distances. *A. melanoxylon, dealbata, pubescens* and probably others do, and I think this is worthy of record. *A. elongata* is well worthy of cultivation.

D. W. C. SHIRESS.

Aboriginal implements.—At Boat-Harbour, at north end of Cronulla Beach, I found a great mound of broken shells left by the aborigines. Near by is a fresh water spring. Strewn about were numerous stones used to crack shells, amongst which were two good basalt axes and one implement evidently an awl, two flat stones for grinding mills and numerous flakes of basalt and quartz.

E. L. HAYES.

Eucalyptus in Brazil.—In connection with the establishment of a large electric steel plant in Brazil, the Jour. Soc. Chem. Ind. XLI., March 15, 1922, p. 102 R., states that Brazilian charcoal is to be used and that eucalyptus forests are to be planted to supply fuel.

This seems to be looking a long way ahead, it does not appear by any means clear why eucalyptus should be preferrable to the native timbers for such a purpose. The planting would require to be on a very large scale.

Ed. *A.N.*

STORAGE TRACHEIDES OF STEM OF VILLARSIA.

By Winsome Hall.

The specimen described was obtained at Maroubra in November, 1921, on the occasion of an ecological excursion of the Girl's High School.

The surface of the leaf is glazed and this serves to reflect excess of light. On cutting a section of the stem, the outer edge was seen to be thickened with Sclerenchymatous cells, the vascular bundles being also similarly surrounded, so that the lumen was very small, these are stone cells or idioblasts. The most interesting feature was the *storage tracheids* of the pith and cortex. These were ordinary parenchymatous cells which had become curiously branched and thickened, with numerous pits over the general surface of the larger branches. The branches are in the form of either rounded projections, or long and spine-like. They numbered from 5 to 9 cells each. Miss Marjorie Collins, B.Sc., has recorded pitted storage tracheids in *Scaevola crassifolia* (Proc. Linn. Soc. N.S. Wales, 1918), these however are only slightly irregular with an occasional short rounded projection.

On teasing out some of the tracheides of *Villarsia* they loosened easily from the soft adjacent cells of the pith and cortex.

NOTES ON ANTHERAEA EUCALYPTI.

By May C. Brown.

In June, 1920, I secured in Queensland a number of cocoons *Antheraea eucalypti* which later in the year I took to New Zealand. Most of these emerged during the months of November and December of the same year. On April 20th, 1922 (almost two years after I had collected them) I was surprised to hear one working on the shell. It worked intermittently, and eventually emerged in quite as lively a manner as usual. Though the wings did not spread, it had all the usual lovely colouration and "eyes," and it laid numbers of eggs, and passed through almost the same existence as the moths which had emerged in 1920. I should be very glad to know if any member has had a similar experience with these moths.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

September 5th, 1922.—The President, Mr. D. C. W. Shiress, in the chair. The meeting was a member's evening. Notes were contributed as follows:—Miss R. M. Winter, "A few observations on Trap-door Spiders"; Miss A. A. Brewster, "Mucilage Cells and Raphides of Hibbertia"; Miss Thistle Harris, "Fossils in Narrabeen Shale," and "Pseudo-fulgurites"; Miss Steinbeck, "The Cocoon of the Cup-moth"; Mr. Cheel, "Notes on *Cladonia retepora*."

October 3rd.—The President, Mr. D. C. W. Shiress, in the chair. Misses O'Shannessey and Dudley, and Mr. Bryce were duly elected members.

Miss H. Drummond gave her lecture: "A Geological Excursion to Mt. Kosciusko." The lecture was full of interest, and numerous geological features were explained in a clear and telling manner by Miss Drummond, who, though probably the youngest member who has given a lecture to the Society, gave unmistakable proofs of a thorough knowledge of her subject. The lecture was illustrated with lantern slides kindly lent by Professor Sir Edgeworth David.

Mr. Gallard exhibited larvae of Thynnid wasps, and read a note thereon. Miss Steinbeck, a fine head of *Doryanthes excelsa*; Miss Butler, fungi from Terrigal, including a fine specimen of the Australian Morel (*Morbella conica*). Miss Crispo, larva found under bark of *Angophora lanceolata*, together with excellent photographs of same. The President read a note on *Acacia elongata.*

November 7th.—The President, Mr. D. C. W. Shiress, in the chair. Among the members present was Archdeacon Haviland, who introduced Mr. and Mrs. C. H. Haviland.

Exhibits were the nest of a Silver-Eye (*Zosterops coerulescens*) woven of threads from the shakings of a mop, exhibited by Master T. Howell, it had been deserted by the birds.

Miss McAnene, Cup Moths, last year's specimens and Lamellicorn Beetle, also an interesting note on an eagle, which captured in infancy became tame and was an excellent means of ridding the farm of rats.

The main business of the evening was a lecture by Professor Harrison on "Some of our Birds." The lecturer dealt mainly with common types, and gave much valuable information on nesting and other habits. The evil ways of the cuckoo, both pallid and bronze-wing, were touched upon and most interesting slides shown of the tragedies consequent on their shirking of responsibilities. The many illustrations as shown by the lantern gave evidence of the patience as well as the skill of the photographer in securing such wonderful and interesting details of bird life. The lecturer stressed again and again the part played by birds in our lives, not only economically, but aesthetically. The birds dealt with were Yellow Bob (*Eopsaltria australis*), Blue Wren (*Malurus cyanochlamys*), Redhead (*Aegintha temporalis*), Honeyeaters (*Meliphagidae*), Fantails (*Rhipidurae*), and many others.

December 5th.—The President, Mr. Shiress, in the chair. There was a very good attendance. The business of the evening was the exhibits of members, which were as follows:—

Miss McAnene, spray of Christmas Bush (*Ceratopetalum gummiferum*) with flower, red calyx and fruit, all complete. Woody capsule of *Xylomelum pyriforme.* Flower of *Lomatia silaifolia,* which she had found fatal to house-flies. Juvenile and adult leaves of *Tecoma australis,* showing variation, fruit-cluster of *Clematis aristata*; Buprestid Beetles; *Persoonia hirsuta,* flowers and fruit of *Clerodendron,* and *Verbascum blattaria,* an introduced weed. Miss Winter exhibited *Trifolium arvensis, Stereum,* an interesting mollusc *Tetbys angesi.*

Mr. Gallard, fine exhibit of life history of Thynnid wasp. He also pointed out its good work among the curl grubs in strawberry beds. Mr. Shiress read most interesting notes on the Eucalypts round Mittagong. Miss Le Plastrier showed the tenacity to life of *Bryophyllum* which on a dry and seeming quite dead branch had hundreds of bud bodies from each of which a new plant would spring. Another interesting exhibit was *Brachyloma daphnoides* in fruit, from the Hawkesbury River. Miss Irby's account of the eclipse as seen from Casino was also read, and, together with the drawing sent, proved very acceptable.

KAVA AND KAVA DRINKING.

By Thos. Steel.

Not the least interesting of the many curious customs of the dwellers in the beautiful islands of the South Pacific, is that of the drinking of Kava or Kawa-Kawa. Most people have heard of Kava, or, as it is called in Fiji, *Yaqona* (pronounced *Yanqona*), but comparatively few who have not had an opportunity of seeing it prepared and used, know what it really is.

Many very erroneous and misleading statements regarding the nature of Kava and its mode of preparation and use by the islanders, have from time to time been put forth. Having had very full opportunities of observing the native methods of making and drinking Kava in Fiji, and having taken a good deal of interest therein, I have ventured to describe somewhat in detail the facts regarding it.

Kava or *Yaqona* is a beverage prepared from the root of a plant indigenous to many of the South Sea Islands, the *Macropiper methysticum* Forst. There are several varieties of the plant varying greatly in quality, known as Wild Yaqona, Mountain Yaqona, etc. In general cultivation I have seen two well marked varieties, one of which grows only to a small size and has dark purple stems, and the other, the true Yaqona plant, is large and freegrowing, with green stems. It is a conspicuous plant, having a strong straggling habit and many branching stems. The leaves are large and heart-shaped. In general appearance it somewhat resembles our garden *Hydrangia* when not in blossom. The portion of the plant made use of is the root, and the small fibrous rootlets are considered the best and yield the strongest *Yaqona*. The root is used both in its green state and dried.

There are two methods of preparation in common use amongst the Fijians, by chewing, and by pounding between flat stones, before mixing with the water. The method of pounding is the one originally employed by the Fijians, that of chewing was introduced from Tonga and has to a great measure taken the place of the original custom; the name Kava is also a Tongan word, *Yaqona* being the true Fijian term.

The root is prepared for use by scraping off the outer bark with sharp shells and cutting into pieces of a convenient size.

It is usually by young girls that *Yaqona* is chewed, but youths also do so. Anyone is not allowed to prepare the drink, but only young people possessing good health and sound teeth.

First of all the mouth is rinsed out with a little water, pieces of the root are then taken and chewed, piece after piece being added until an onlooker not used to the operation wonders greatly when the limit will be reached.

When a good sized mass has accumulated in the mouth and is sufficiently masticated, the operation taking eight or ten minutes, it is carefully dropped into a large wooden basin called *tarnoa*. This is accomplished either by taking the mass into the hand and placing it in the *tarnoa*, or what is considered more correct, by depressing the face in the *tarnoa* and gently dropping the chewed root therein.

The mass of root so prepared presents the appearance of a handful of moist sawdust. The operator then proceeds to masticate another mouthful, three or four girls generally being employed and the chewing continued until a sufficient quantity has been prepared. Frequently a little water is taken into the mouth to moisten the dry root.

One of the girls, having first washed her hands, kneels down beside the *tarnoa* and proceeds to carefully knead the contents with a small quantity of water, until they are thoroughly incorporated, more water is then added by pouring in a slow stream from an earthenware vessel such as those exhibited, or from a joint of a large bamboo which is used for holding and carrying supplies.

When sufficient water has been added, the particles of pulverised root are carefully strained out by means of a bunch of fibres of the *Vau* (*Hibiscus tiliaceus* and *H. tricuspis*). The bunch of fibres is held at both ends and then passed horizontally through the liquid in such a way as to cause the solid particles to become entangled, the strainer is then lifted out of the liquid, strongly wrung with the hands, and the particles of root shaken out. This operation is repeated until the liquid is sufficiently strained, when it presents the appearance of a turbid greyish-brown solution, somewhat resembling clayey water.

More water is now added to dilute the decoction to the proper strength for drinking.

The cocoanut drinking cup called *bilo*, is now filled and passed to the person of highest rank present, or to the visitor. The proper proceeding is for the person who prepared the

Yaqona to dip the strainer in the liquid and fill the *bilo* by squeezing it into it. It is customary to drink the contents of the *bilo* at one draught, this being accompanied by clapping of hands and slapping the thigh with the hand, by the people present. As soon as the drinker has finished, all present say *"a maca,"* pronounced *"matha,"* meaning "empty" or "the bowl is finished." The drinker responds with the exclamation *"bula,"* pronounced *mbula,* "good health," or else the common Fijian expression *"moli or wo,"* which means "thanks" or "my respects." Having finished the contents of the bowl, the drinker adroitly sends it spinning across the mat-covered floor towards the *tarnoa.* In Samoa and other islands it is customary to pass the bowl back from hand to hand.

In great ceremonial drinkings of *Yaqona,* cups made by twisting a piece of plantain leaf, just as a grocer makes a twist paper bag, are often used, a new cup being used for each drinker.

By constant use the *tarnoa* and *bilo* acquire a very fine coating resembling enamel, of a bluish white color, and this when perfect is a sign of age and the article is highly prized. It is in order to avoid injuring this enamel by scratching it with the drinking bowl, that the latter is filled by means of the strainer. When the turbid liquid prepared as above is examined microscopically it is found that the turbidity is due to multitudes of starch granules, and although I searched with care I never found any raphides or oilglobules.

Yaqona is always drunk freshly prepared, and never, as I have frequently seen stated, after keeping or in a fermented state. If allowed to stand, the starch grains sink, leaving a clear light-brown liquid which soon becomes sour and offensive. Being curious to know how much saliva the *Yaqona* gained in the process of chewing, I made several experiments with natives habituated to this method of preparing the root. I found that there is some variation, the gain in weight varying from 119 to about 180 per cent. of the root taken. Thus in one experiment 133 grams of the cleaned root were chewed by a native. The weight after chewing was 292 grams, an increase of 159 grams or 119 per cent. This was sufficient to make about 5 pints of the liquid, and as a pint is a very moderate allowance as a draught for one person, each person would get nearly 32 grams or rather more than 1 oz. of saliva. The late Dr. W. Macgregor, afterwards Sir W. Macgregor, of New Guinea, when resident in Fiji had 6 ounces of the root chewed and found that after the operation it weighed 17 oz., a gain of 11 oz. or 183 per cent. of the root taken.*

I have frequently drank *Yaqona* prepared by both the pounding and the chewing methods, and I cannot say that I noticed any particular difference in flavour or effect, though the Fijians and many Europeans say it is much better when prepared by chewing. Amongst Europeans resident in Fiji the root is very commonly prepared for use by grating to a coarse powder on an ordinary vegetable grater.

The taste of the liquid is a pungent aromatic, reminding me somewhat of the flavour of calamus root. Few people like it at first, but the taste for it is readily acquired, and it is very extensively and regularly used by Europeans resident in the islands. *Yaqona* is a mild diuric and tonic, and is favoured by many medical men, it has a well-established popular reputation as a blood purifier. In moderate quantities it is slightly stimulant and tonic, especially when drank in the evening after a hot day. When taken in excess it is stated to produce a peculiar muscular intoxication, so that the drinker is unable to use his limbs, the brain, however, remaining clear and but little affected, this state is called *Mateni* by the Fijians. I have never personally experienced this effect, though on one occasion I purposely tried to produce it by drinking as much *Yaqona* as I could swallow, until I felt an uncomfortable cold dilation of the stomach and my thirst for knowledge became swamped in an amply quenched thirst for *Yaqona*.

It is astonishing to see the quantity of *Yaqona* which natives and Europeans who have become habituated to it, will consume. I have repeatedly seen one man drink a *tarnoa* full holding from 1½ to 2 gallons, in the course of an evening, and even larger amounts are drunk by some individuals. The same amount of ordinary water would almost certainly induce an attack of dysentery.

A very decided craving for *yaqona* is acquired by individuals, but this is neither so strong nor anything like so hurtful in its effects, as that for alcohol.

The Fijians call spirits and fermented liquors *"lialia ni yaqona,"* meaning literally, "the other kind of yaqona," and *"yaqona ni papalagi"* or the "white man's yaqona."

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*Gordon-Cumming. At Home in Fiji. 1882. p. 51.

In New Zealand a plant much resembling the Kava plant of the South Seas and closely allied to it, *Macropiper excelsum,* is indigenous. The Maoris call it Kawa-Kawa, but make no use of it nor do they appear to have had any idea of such a preparation as the Kava of the South Sea Islands. Considering the undoubted origin of the Maoris in these islands, and the identity of the name Kawa-Kawa with the Kava-Kava of many of the islands, this is somewhat remarkable.

The nature of the chemical principles of the Kava root has been investigated by several chemists. There is present a crystallisable substance called *Kavahin* or *Methysticin,* which crystallises from the alcoholic solution in white silky needles, but is physiologically quite inert.

The real active principle of the root, to which it owes its properties, consists of two obscure resins which were named by Lewin who first isolated them, *Alpha-Kava-Kava* resin and *Beta-Kava-Kava* resin.*

THE ECLIPSE AT CASINO.

By F. M. Irby.

To a kindly professor whose advice to onlookers appeared in the *Brisbane Courier,* I am indebted for the advice which enabled the enclosed drawings and notes to be made. I laughed when I read, "Have two sharp pointed pencils by you," but, acting upon it I tied a second one in the corner of my handkerchief and, but for this, both sketch and note would have ended abruptly. September 21, 1922, waked at daylight, all the birds in the tea-tree swamp singing, lovely morning, clear blue sky. Sky bright and clear, at 3.9 p.m., moon's edge on sun. Ten minutes to 4 strong wind started, sudden curious drop in temperature, had to put jackets over our light dresses, temperature 69°, night-scented stocks started to unfold flowers, yellow cassia leaves closed, sparaxis flowers partly closed. 5 past 4, temperature 67, 7 past 4, temperature 66, fowls waiting to be fed, hen with chickens gone to bed. Quarter past 4, a flash like that made by a patent gas lighter and the last bit of sun went out, temperature 64. Birds flew wildly to shelter of trees, hens ran to fowl house, some too late to find their way, staggered wildly to and fro. *Lost pencil!* Remembered second one in handkerchief and felt grateful to unknown professor. Sight too wonderful to describe, a black moon surrounded by a ring of unearthly white, with four great points of light, left hand top point considerably shorter than other three, and a scarcely perceptible difference in the length of the lower left point. There was no dew. There was sufficient light to make rough drawing and notes, but it was not the light of life, it could only be likened to the light of a dead world, grey, unearthly. Eighteen past 4, and a brilliant flash as though a star had burst into being, and the old light of the work-a-day world came slowly back.

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*Jour. Soc. Chem. Ind. London, Vol. VIII., p. 304, and Vol. IX., p. 411.

FROM A BUSH NOTE BOOK.

By F. M. Irby.

Birds are curiously gregarious, I do not mean birds of a kind, but any species. You may go to some likely looking bit of bush or scrub and search it through without finding a single nest, and probably seeing so few birds that you come away bitterly disappointed, and probably under the impression that you are in a district painfully destitute of bird life; but, wandering to another bit of bush, a quarter, or half a mile distant, you will possibly find it fairly teeming with feathered folk. It reminds one of the human rush for cities.

There is a small damp spot, on the edge of the tea-tree swamp, just behind the house where I have never failed to find birds building, it is only a small patch, possibly an acre or two in extent, it is dense with rugged paper-bark tea-trees, in spring their tops a mass of feathery white bloom, and it is closely surrounded by sweet scented flowering mahogany trees, loved by the Honey-eaters, Blue-faced Honey-eaters (*Entomyza cyanotis*); Soldier birds (*Manorhina garrula*); Yellow-throated Friar birds (*Philemon citreogularis*); Yellow-faced Honey-eaters (*Ptilotis chrysops*); and Blood-birds (*Myzomela sanguinolenta*); are particularly numerous, while at times there are other varieties.

In one gnarled old paper-barked tea-tree there I found a Willie wag-tail (*Phipidura tricolor*) nest, a Pee-wit's (*Grallina picata*) nest, and also a huge bulky one belonging to a pair of Happy family's (*Pomatorhinus temporalis*), but then every bushman will tell you that practically four times out of every six, you will find the nests of the Willie wag-tail and the pee-wit in the same or adjoining trees. In another tea-tree, only a few yards further on, a Yellow-throated Friar bird, a Black-throated Butcher bird (*Cracticus nigrogularis*) and a Pee-wit, all had their homes, it seemed unusual to see the others building so near the Butcher bird and I wondered which had chosen the site first.

It is common to find several nests of the Happy family built in the one tree, but these seldom have any eggs in them, unless, indeed, a Blue-faced honey-eater has taken possession; whole companies of these energetic little birds seem to delight in building nest after nest, with what object it is hard to determine; it is different if you see a solitary pair gathering material and building, and you may be sure of finding eggs in the finished nest. Down a little hillside on the Tweed I recently saw the quaintest position chosen by a Mopoke (*Podargus strigoides*), for her nest; there was a tall stump scarcely any thicker than a telegraph pole and just as straight and bare, though considerably taller, being fully fifty feet in height, and right on the jagged top, where it had broken off during the felling of the scrub sat the poor old *Podargus*, exposed to the full blaze of the sun. All day long she apparently sat there, oblivious to everything around her, only altering her position slightly and stiffening her head so that she seemed to become an actual part of the broken stump, if you threw anything near enough to attract her attention. Since I saw her I have been told that there are now two young ones sitting beside her and it is hard to believe that three of them can find room to perch on top of that narrow pole. My brother told me of one of our Mopoke's nest which he found in the fairly low bough of an apple tree, one of the old birds sat on the nest, which contained a young one like a little white ball of fluff, and on the ground just beneath the other old bird sat on a similar chick. We could only imagine that the newly hatched infant had in some way overbalanced or been blown out by the wind, so was being cared for by one parent, while the other watched over the little one in the cradle above.

On this same hill-side were more Coach-whip birds (*Psophodes crepitans*) than I had ever seen in any one place before; although the scrub had been cleared there was a great deal of undergrowth, and they used to hide in a dense thicket of small shrubs, locally known as "wild coffee." Silent during the heat of the day, about half past five every evening they commenced calling, continuing until it was dark. You read much about the shyness of the Whip-bird, but doesn't it almost seem as though the main difficulty in observing this bird is the astonishing way in which its colouring assimilates and blends into its surroundings, its curious stillness aiding the deception. I saw one nest there, about four feet up in a dense green bush. The bird sat quietly watching us until we could almost touch the nest, then flew to a moss-covered log about five feet away, becoming instantly lost to sight; there were two wonderful blue-green eggs spotted with brown, and I returned a few days later hoping they might have hatched; this time the bird showed no fear, but waited until I placed my hand on the rim of the nest, one second she hesitated while I wondered if she would let me stroke her, then with a gliding movement she dropped over the edge of the nest and lay motionless on the ground, becoming at once one with the old charred lichen covered logs and foliage below.

NOTES ON THYNNID WASPS.

By Luke Gallard.

Until recent years, very little was known about the habits of the Thynnidae, and I feel there is yet a good deal to learn about these useful creatures, the female of which burrows into the ground and wages warfare against the curl grubs, which of late years have become such a pest in our strawberry beds. With this end in view I decided to make a few observations this year.

I chose two places about 4 miles apart to give me a fair range. In one I subsoiled about half a rod of ground and secured 7 Thynnid pupae and about a dozen curl grubs. In the other I treated about 1 rod in a similar way, and from it I secured 13 Thynnid cocoons, 2 Scoliid cocoons and two larvae clinging to the curl grubs, and about 3 dozen larvae and pupae of the curl grubs. In both cases the land treated was part of an old strawberry bed, which had been badly effected with curl grubs last season. As the ground was very dry, I had to dig deep, and most of the specimens were taken at depths varying from 5 to 10 inches, the wasp cocoons almost invariably being at the lower depths. Possibly this accounts for the lack of data in connection with them. These were taken between September 2nd, 1922, and October 8th, 1922. I opened some of the cocoons, and found that the grubs were still in the larval form. I also found two small sized Thynnid larvae free in the soil, but so far I am unable to say whether these had been attached to a grub or whether they had crawled out of a damaged one. In the last week in September I saw quite a number of the medium sized brown Thynnids of the male sex flying about amongst the orange blossom, but I could only see an occasional female. This continued till the end of the first week in October. On the 10th of October I noticed the wingless females crawling up a paling fence in Epping. I secured about a dozen of these without seeing a male. On my way home, about 50 yards from where I had been catching the females, I had to pass a blackberry hedge. Here I found a cluster of male Thynnids hanging four or five thick like a swarm of bees. On strolling down the hedge I found another large colony and several smaller ones. At the two largest colonies I disturbed a few to enable me to form an idea as to the number of wasps there were in each colony. At the very least I estimated the two large ones to contain 1,500 each, and in the whole, I consider that 4,000 would be a small estimate of the number of wasps, within 30 yards of each other. Choosing one of the smaller clusters, which were hanging on a honeysuckle vine, I swept my net up under it, and secured over 500 in the one sweep. A part of these I am exhibiting to-night, the remainder I liberated. I visited the locality the following morning soon after sunrise to make further observations. They were all there. I stopped in the locality for about an hour, and caught 6 more females off the fence. When I left at about 8 o'clock the clusters were still intact. About an hour later, as I was passing, I noticed they were scattering freely. At 1 p.m. there was only a few scattered ones in the locality, but at 5.30 p.m. they were all there in their clusters again. This they did for 4 nights, and then they began to disappear gradually, and within a week they had all dispersed. Probably the females found crawling up the fence had been dropped by the males during the day.

Though I took about 30 around this locality, I only found two pairs in cop. All those on the fence appeared to have lost their charm for the males, but where I found a few amongst the leaves the males were in evidence.

I submitted several of the males found in the clusters to Mr. W. W. Froggatt, and he identified them as *Thynnoides pugionatus.*

The females of this family are wingless creatures, resembling fat ants. During the pairing season they are picked up and carried about by the winged males. After being dropped by the males they burrow into the ground and lay their eggs on curl grubs, etc., in the ground. In this respect it is difficult to estimate their worth.

LIFE CYCLE OF PSYCHOPSIS MIMICA.

By L. Gallard.

On January 28th, 1921, I received from Miss Brown, Albury, one of our members, a fine adult specimen of *Psychopsis mimica* (Aust. Nat., v., p. 64). This specimen was forwarded by post, and en route it laid a number of eggs in the box. During the first week in February nine of these hatched, and I resolved, if possible, to rear them. I fed them on small Lepidoptera larvae, and was able to carry three of them on till November. Two of them then died, but the remaining one fed on cheerfully until December, when it appeared to be full fed and ready to spin up, and each day I expected to see it spinning its cocoon, but December and January passed without any change, and I felt satisfied I had to settle down to a twelve months wait. I continued to feed it till winter set in, and it entered its state of quiesence. When the spring came round it revived, and began to feed freely again, and, finally, on October 15, 1922, it spun up in a lovely white silken cocoon. Here it lay till December 16, 1922, when it emerged a beautiful adult specimen. The time, therefore, from the laying of the egg to the emergence of the adult, was one year, ten months, and twelve days. The most important part of this from a field Naturalist's point of view is, that Miss Brown, by her humble effort, enabled me to obtain the complete life cycle of such an important insect, and (through the Journal) I would like to extend to her my hearty thanks, with the hope that it may inspire other members to follow her example.

Psychopsis elegans.—This is the same insect—as was written up by me before (Aust. Nat., vol. iii., p. 29) as *Psychopsis newmani*, but Dr. Tillyard has since altered the name to *P. elegans*. These specimens were bred in December, 1922, from larvae taken at Kenthurst.

Two specimens of *P. gallardi* we secured on the rocks at Kenthurst on January 14, 1923, and at the same place and date *Spermophorella disseminata*.

SOME EUCALYPTUS ABOUT MITTAGONG.

By D. W. C. Shiress.
("Weeroona.")

To the student of the eucalypts a visit to the Mittagong, Bowral, Berrima district will prove of absorbing interest, and be a welcome change from the coastal types peculiar to the sandstone country, and I may say to the influences of the sea air.

I purpose enumerating the species to be met with, and as most of them are to be found on the roadside, shall take you first of all for a walk from the Mittagong Station along the Berrima Road, where Sieber and others of the early botanists collected as far back as the 1820's.

As you approach the Chalybeate Spring you first meet with *E. radiata*—(a form of *E. amygdalena*)—to the right, and on the banks of a creek is a clump of *E. ovata*—about the spring, *E. dives*, the typical form and also a narrow-leaved one—to the right again is *E. maculosa, rubida, haemastoma, dives*, and, again, on the left on the banks of a creek—the headwaters of the Nattai River, *E. ovata, viminalis* at the bridge—with *radiata*, then you meet *punctata* for the first time, then *eugeniodes, haemastoma* and *amflifolius*, the cabbage-leaved gum, and down the hill to the turn off to Mt. Jellore, *E. dives, maculosa, rubida, numerosa*, and enter a glade of *E. maculosa, piperita, rubida, viminalis*, one of the most delightful spots on a hot summer's day. Faithfull's Paddock forms the western boundary of the road here, and, if before entering this pleasant glade you leave the road to the right and go along the boundary fence, you will find a cattle shelter formed of *E. radiata*, and, further, if you happen to be one of the many who can see nothing beautiful in our native trees, and can come away from that shelter without saying, "God alone can make a tree," I will give you up. By keeping on along the fence you will meet *E. coriacea*, two forms, one typical, the other smaller fruited, and with a box like bark, *E. coriacea*, is a scribbly gum like *E. haemastoma*, further along is a single tree of *E. vitrea*, which has small irregular shaped fruits and narrow leaves and a box bark. Returning to the road again and passing the old Joadja-Wombeyan Caves Road, you pass through what was once the Sandy Flat racecourse, now a forest of *piperita*, with a sprinkling of *radiata, maculosa, viminalis, eugeniodes*, along the road, *E. ovata*, on the banks of a creek, which comes from behind "Cutaway" Hill, and then up to the top of a sharp incline *E. punctata* and *eugeniodes.* You cross the Wombeyan Caves Road from Bowral, down the hill on to Berrima—*E. radiata* is the first met with, and then a clump of *E. viminalis.* The country here has been cleared for sheep and cattle, but on the crest of the first rise is a forest of *E. radiata*—down again you meet *E. ovata*—then for the first time *E. macarthuri,* again *coriacea,* and as you reach the hill overlooking Berrima, *E. siberiana,* a form of *E. eugeniodes,* which looks like *capitellata,* and which is termed locally "White Stringy," then *E. stellulata, rubida, radiata* and on the banks of the Wingecarribee River, *E. macarthuri.*

Once again starting from the Mittagong Station and ascending the Gib, you meet the first stranger in *E. agglomerata,* a glaucous form of *capitellata,* then *viminalis, Smithii, gigantea* var., *fraxinoides*; *E. Smithii* is the principal tree on the summit, and, descending, *E. gigantea* helps you down the steep hillside to Bowral, where you see *E. macarthuri* in all its glory, *E. viminalis* and a large fruited form of *E. radiata,* which I understand has been named *E. australiana* on account of its oil contents. It is rather confusing, as it is impossible to distinguish a tree by its oil contents in the field. The size of the fruit appears to be due to the fact that the tree is growing in volcanic soil, as you here find *E. punctata* also with very large fruits.

The district, in which you meet three classes of soil, is interesting as showing the partiality of some of the eucalypts to a particular soil; *Smithii,* for instance, is found only in the volcanic soil, *Macarthuri* requires also a rich heavy bed, *radiata,* like *eugeniodes,* will grow anywhere, *E. agglomerata* can only be met on the western slope of the hills, about 100 feet from the level.

A large patch of *E. stricta* is to be met with near the Jellore Road, and a single tree with every appearance of *E. stricta,* a gum with scribbly bark, just before the turn off to Joadja. If you follow to the top of the first rise on the Joadja Road you will find *E. quadrangulata* (a box), some of the tree being at least 100 feet in height, and in Dalton's Paddock on the eastern slope some very old trees of *E. numerosa* with heavy black woolly bark deeply furrowed like old ironbark trees.

I have not met with any ironbark in the district. It appears to stop at about the 1,700 feet level on the coastal slope of the Tableland, nor in the sandstone country *E. corymbosa,* except about Hilltop, where it is plentiful.

I have experimented with the ironbarks, planting six of each *E. leucoxylon,* from seed obtained in Bendigo, Victoria, and *E. sideroxylon* from seed obtained at Fairfield, the result was that in one year's growth *E. leucoxylon* reached a height of 5 feet 6 inches and *sideroxylon* only one foot, thus showing that the coastal ironbark did not like the cold or the soil. The *E. leucoxylon* is now a fine tree, having flowered last winter, and the *sideroxylon* (three years old) a bush only three feet in height, an economic lesson in my opinion worthy of record.

EUCALYPTS FLOWERING IN AUGUST AT COPMANHURST.

E. maculata, bancrofti, baileyana, microcorys, crebra, paniculata, eugeniodes, tereticornis.

IN SYDNEY DISTRICT.

Robusta.

NOTES AND COMMENTS.

VERNACULAR NAMES. · From an esteemed member of our Society, Mrs. Edith M. Jones, of Harris Park, we have a request for the use in as far as possible of vernacular names in addition to the scientific. We would commend this request to our members. The charming paper in this issue, "From a Bush Note Book," by Miss F. M. Irby, is a most excellent example. Where there are well established vernacular names in the case of plants and insects, the same plan might be followed more fully than has been the case in the past.

EDITOR, *A.N.*

CARPET SNAKE. In reference to Mr. Stinson's note, Aust. Nat., V. 81. About thirty or more years ago a carpet snake was caught and killed in a fowl house in Cairns by Mr. Robt. Johnstone, head of the native police. He skinned and stuffed it, and sent it to the Brisbane Museum, where I saw it about ten years ago. The snake measured 22 feet.

EDITH M. JONES.

MR. CHEEL. It was with deep regret that the Council accepted the resignation tendered by Mr. E. Cheel. The services of this scientist to our Society could hardly be over-estimated, and we look forward to profiting by his help and advice for many a day to come. Only over-pressure of work could compel him to relinquish his position as Hon. Secretary, a position he has adorned more than once. Research work is now claiming all his spare time, and since the Society will benefit by his labours, it must acquiesce in his retirement from the Secretaryship. The office has been conferred on Miss Le Plastrier, who has been acting for the past few months.

CHAEROCAMPA OLDENLANDI.

By MARY FULLER.

The larva of this hawk moth was found on 21st December at Wondabyne, feeding on a vine. It was 2½ inches long—grey, thickly speckled with tiny yellow spots. A wide black stripe ran down its back, margined with yellow spots and traversed by eight yellow bands. On the margin of the black stripe and terminating the yellow bands were large eye-spots—one at each end of the bands. These were orange and yellow in the centre with pale blue on either side, and finally ringed round with black. The four spots nearest the head had a black dot in the centre.

The margin of yellow spots was continued down to the mouth. The "tail," which is so characteristic of the family, was black with a white tip.

On the 27th the caterpillar pupated. It made a loose shelter of leaves and twigs in the corner of the box, and changed into a pupa on the sand.

The pupa was light grey, speckled with black. After about three weeks it turned to a darker colour. On 17th January it was very dark with the wing-pads quite black. During the night the moth emerged, and on the morning of the 18th was ready to fly. It measured 2¼ inches across the wings, the ground colour of which was grey on the forewings and brownish-fawn on the hindwings. A brown and silver stripe ran the length of the forewing, whilst the hindwings had a faint trace of pink near the margins.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

February 6th, 1923.—The President (Mr. Shiress) in the chair. There was a good attendance. Mr. A. A. Hamilton spoke of the forthcoming flower-show, as he thought the members should begin their preparations early. The same sentiment was voiced by other speakers. It was decided to more fully discuss the matter later on. Miss H. Drummond exhibited two fossils from Allendale, *Eurydesma cordatum,* an external cast showing heart-shaped cross section, and also an internal cast of the same, showing the thick shell and attachment muscle scars. Mr. Gurney, a Queen ant (*Campanotus*), captured 31st December, 1922, laid 5 eggs on 12th January, 1923, 3 more on 25th January. The insect had nothing but water for 5 weeks. Mr. Gallard contributed a note on life cycle of *Psycopsis mimica.*

Mr. Finckh, a small floating water plant (*Lemna arrhiza*). Miss Winter, an excellent specimen of *Bullinula ziczac,* collected at Long Reef, with note.

Mr. A. S. le Souef then gave an interesting address on "The Approaching End of the Age of Wild Mammals." A summary of the lecture is printed elsewhere. A hearty vote of thanks was moved by Mr. A. A. Hamilton, and seconded by Mr. A. G. Hamilton, and carried by acclamation.

In conclusion, the President mentioned the excursion for the following Saturday, when Mr. le Souef was to conduct members to points of interest in Taronga Park.

March 6th.—The President (Mr. Shiress) in the chair, and a good attendance.

Dr. Rodway and Misses Chisholm and Cusbert were duly elected members. A welcome was extended to three visitors, Mr. and Mrs. Newpo, of Rabaul, and Miss Bell, of the Western Province Naturalists' Society of England.

An interesting paper on "The Lizard Rock" was read by the Hon. Secretary for Mr. Thos. Steel.

A paper on the "Flora of Marrangaroo" by Dr. Chisholm was presented by Mr. Blakely. The President gave an outline of the scope of the paper, and proposed that it should be printed in the Journal, seconded by Mr. Finckh, and carried.

Mr. Mackerras then gave a most interesting account of the life-history of the Mosquito, which was illustrated, not only by lantern slides, but by living material under the microscope. He outlined the distribution of the insects, and stressed the differences between the species, especially *Culex* and *Anotheles,* the carrier of malaria. One of the most interesting of the pictures was that of a tank full of larvae, which Mr. White had arranged. The whole lecture was most fascinating, and opened up avenues of work for entomologists and for all also in combining to exterminate the scourge.

April 3rd.—The President (Mr. Shiress) in the chair. Miss Day was elected a member. Miss H. Butler exhibited a collection of hawk moths and plants indigenous to Bundaberg. Miss Harris a series of Broken Hill plants, illustrating xerophytic conditions. Miss Harris read a paper, with drawings, on the red sea weed (*Callithamnion plumigerum*). After discussion, it was decided to hold an exhibition and a strong committee was appointed to make the necessary arrangements.

May 1st, 1923.—The President (Mr. Shiress) in the chair, and there was a good attendance. Dr. Chisholm was duly elected a member. Miss Butler exhibited *Banksia spinulosa,* showing abnormal growth, probably due to drought conditions. The spike having terminated, a fresh growth has then sprung from the apex. Miss McAnene interesting fungi (*Geaster*) known as "Earth stars," from Bundanoon. Miss Crispo three species of sedge found in her garden, the seeds having been brought by birds.

Mr. W. B. Gurney gave an interesting and instructive lecture on "House and Garden Pests," with particular reference to boring beetles. The lecture was illustrated with a fine collection of specimens, including pieces of affected timber.

"THE APPROACHING END OF THE AGE OF WILD MAMMALS."

By A. S. le Souef.

It is very clear to those familiar with the trend of Zoology in a broad sense to-day, that we are approaching the end of a very important phase in the history of the wild life on the earth.

Investigation of fossils shows very plainly that the animals of the earth have passed through three very important phases, in which certain types became predominant, reached their climax and passed away. The first phase, which comes prominently under notice is that of the invertebrates and the fishes. This was followed by the age of reptiles and amphibians. It was in this age that the reptiles reached their highest development, and their greatest size, some forms absolutely dwarfing the largest animals alive on the earth to-day. These animals chiefly through over-specialisation, which left them quite unsuited to withstand any change in their environment, have absolutely passed away. The age of mammals has passed through two stages. The first is indicated by the magnificent faunas which developed in America, Europe and Asia, prominent members of which were the Mastodon, Mammoth, Woolly Rhinoceros and the Titanothere, and nearer home, the Diprotodont with its contemporary the Thylacoleo, and the Moa. This phase passed, probably as a result of a glacial period, and we have the rich and complex faunas inhabiting the world to-day. This may be stated to have reached its highest development in point of numbers at the beginning of the last century.

Profound changes have been produced by man among the wild animals during the last 150 years. Commercial interests have caused the slaughter in enormous numbers. The occupation of the land by man has driven the animal inhabitants off. In a zoological sense we have entered into the age of man, and in the near future all the habitable land will be required by man, and the only animals that can remain will be those of economic use, so it is clear that we are getting very near the end of the age of Wild Mammals.

The causes of the disappearance of the Australian animals is not only the occupation of the land by pastoral and agricultural interests, but far more important is the introduction of animals from other countries. The fox, the cat, the rabbit, the rat and mouse, animals reared in a hard school of adversity and competition are a million years ahead of our primitive rodents and marsupials, and they are rapidly occupying their heritage. Already the Bridled Nail-tailed wallaby has gone, the Brush-tailed Rock-wallaby is on the verge of extinction. Eastern and South Eastern Australia have been practically cleared of rat-kangaroos and bandicoots and native-cats. One thing has so far stayed the advance of the fox on the eastern coasts and that is the Poison Tick, but it is very likely that immune animals, will in time, invade this area and complete the destruction.

The only hope of preserving our animals is to have large reserves of suitable country set aside, properly patrolled and kept free from predaceous animals. It is certainly our duty to keep our fauna intact to hand down to posterity.

CHANGING PLANT NAMES.

By E. Cheel.

(Abstract of Lecture.)

It not infrequently happens that in our Botanic Gardens, as well as in some of our seedsmen's catalogues, the names of certain well-known plants are changed, without any explanation as to the reason for such changes. To see a familiar plant labelled with a new name in place of the one ordinarily accepted, tends to make the study of botany more or less unintelligible, and leads to confusion in scientific study, and also reflects adversely upon the reputations of those who are responsible for such changes. In some instances the necessity for making changes in plant names are unavoidable, because of the re-subdivisions of many of the larger genera. When large divisions or groups are divided or subdivided into new subdivisions or groups, and families are divided into sub-families, and genera into sub-genera, or even a Linnean species is split up into what is known in modern times as sub-species or micro-species, it is desirable in such instances to create new names, as in such cases it is quite possible that the ordinary student may not be able to grasp the reasons for such subdivisions, especially as the most distinguished botanists are perpetually at variance with each other, as to the subdivisions of the vegetable kingdom, and have not yet arrived at a satisfactory conclusion, as to what constitutes a family, genera, species or variety. It was stated many years ago by a distinguished horticulturist that "the science of the botanist at the best is very unstable, because it is entirely a science of conjecture, liable at all times to be overset by the test of cultivation. . . . ." To emphasise this statement the same writer points out that "Rhododendrons and Azaleas belong to two classes, widely separated by the number of the anthers, yet they will breed freely together." When we realise that the genus *Rhododendron* is distinguished from *Azalea*, by having 5 to 10 stamens, with anthers, having two terminal pores, whereas in *Azalea,* there are only 5 stamens, the anther cells opening by a terminal pore, we can quite understand that the offspring as a result of crossing species of the above genera, would create a considerable amount of trouble for the taxonomist, who perhaps was unaware that they were the products of crossing. Quite apart from these species or supposed varieties of species found in Nature or obtained as a result of artificial cross-pollination, there are other forms of plants to be considered, such as "chimaeras" and "sports," which by some are considered to be in the same category as "Graft Hybrids." The bi-nominal system of nomenclature adopted in botanical works commences with Linne in his "Species Plantarum," published in 1753, but as pointed out above, it has been found that many of the Linnean species contained elementary or micro-species. As many of the latter breed true, the term "Jordanon" species has also been applied. It will thus be seen that new names have had to be created when separating the latter. Several conferences have been held for the purpose of creating a regular system of nomenclature, which could be used and recognised by botanical workers in all countries. One of the most notable achievements made in this direction was the list of *Nomina conservanda,* which was passed by 133 votes against 36 at the International Botanical Congress of Vienna (1905). In the list referred to there are quite a large number of generic names of Australian plants, which have been preserved. To quote a few of our well known New South Wales genera, the following will give some idea of the changes which would otherwise have had to be made:—

Cynodon.—This is our common "Couch Grass" (*C. dactylon*). American botanists adopt the name *Capriola* of Adamson, published in 1763. The name *Cynodon* of Rich. was not published until 1805.

Isopogon, R.Br., published in 1809. *Atylus,* of Salisbury, published in 1807, is the same plant.

Kennedya, of Ventenat, 1804, is the same as *Caulinia,* of Moench., 1802.

Lomatia, R.Br., 1810, is the same as *Tricondylus,* of Salisbury, 1809.

Persoonia, Smith, 1798, is = *Linkia,* of Cavanilles, 1797.

Pimelia, of Banks and Solander, 1788, is *Banksia,* of Forster, published in 1776, but not the *Banksia,* of Linn. f., published in 1781.

Telopea, R.Br., 1810 (our Waratah), is *Hylogyne,* of Salisbury, 1809.

Wiksstroemia, of Endlicher, 1833, usually spelt erroneously
Leptospermum laevigata var. ? *minus* F.v.M., in B.Fl., iii.,
by Smith in 1797.

Zoisia, of Willdenow (1801), usually spelt *Zoysia* is *Oster-*
as *Wickstroemia,* is *Capura,* of Linn., 1771.
damia, of Necker (1791).This latter name is still used for this common coastal grass by American agrostologists, notwithstanding the agreement of botanists at the Vienna Congress.

Tragus, of Haller (1768), is *Nazia* Adamson, 1763. This is a common grass in the interior, commonly known as "Bogan Flea Grass."

The above are a few of the generic names which would have to be changed, but for the agreement made irrespective of dates of priority.

Another generic name which is worthy of mention is *Erythraea,* of Necker (1790), which is *Centaurium,* of Hill (1756). The Congress held at Brussels, in 1910, included the name *Erythraea* in the list of *Nomina conservanda,* yet we find that Druce (2nd Suppl. Bot. Soc. & Exchange Club Report (1916) 612) has overlooked this fact, and recommends quite a number of new combinations.

The plan of fixing the earliest specific name given is an excellent basis for stability as regards the species. If an author, through ignorance of bibliography or any other cause, creates a new specific name for a species previously described in the same genus, the first name is preserved and the new name enters into the synonyms. It is owing to this rule, that a number of specific names used by Bentham and Mueller, are to be upset by future workers. Thus we may mention the following as a few examples:—

Angophora lanceolata, Cav., of Australian works, should be *Angophora costata* (Gaertn.). This new combination has already been effected by Druce, *l.c.,* as the specific name *costata* was published in 1788 or nine years earlier than the specific name *lanceolata,* of Cavanilles.

Micromyrtus microphylla, Benth., should be *Micromyrtus ciliata* (Sm.), Druce, as the specific name *ciliata* was published

Leptospermum abnorme F.v.M. This should be *Leptospermum brachyandrum* (F.v.M.) as the latter specific name was least five years priority over the name *abnorme,* which was not published until 1866 in Bentham's Flora Australiensis.

Leptospermum laevigate var. ? *minns* F.v.M., in B.Fl., iii., p. 103 (1866). This was published by Mueller in 1856 (Miq. in Ned. Krudk. Arch., iv., 147) under the name *Fabricia coriacea.* The name *coriacea* has ten years priority over the name *minus* of Bentham, and as the plants referred to are distinct from the coastal forms of *L. laevigata,* it is proposed by the writer to take up the name *coriacea* and *raise* it to specific rank.

Chiloglottis diphylla, R.Br., 1810. This was published in 1806 by Labillardier under the name *Epipactis reflexa,* therefore the specific name *reflexa* has four years priority over *diphylla.*

Quite a large number of similar instances of priority can be quoted, but space will not permit of this being done in the present paper; but the few cases quoted are of sufficient importance, as showing the need for a revised edition of the "Handbook of the Flora of New South Wales."

Several new combinations have already been made by Druce, *l.c.,* but care must be taken not to copy his list blindly, or other mistakes will be made. For example, the new combination in connection with *Scaevola ramosissima* (Sm.) Krause, has already been shown by the late Mr. Betche in this Journal (Vol. 2, p. 158, 1912), and must not, therefore, be shown as *Scaevola ramosissima* (Sm.) Druce, as Krause (Pflanzenreich, 54 Heft., iv., 277u 277a, p. 141) had already effected the new combination in 1912.

Other instances in which plant names must be changed are, those where it can be shown that a misdetermination has been made. For example, a common weed listed in Moore and Betche's "Handbook of the Flora of New South Wales," p. 525, 1893, under the name *Tolpis barbata,* Gaetrn., is really *Tolpis umbellata,* Bert., as already shown by Ewart, White and Rees in Proc. Roy. Soc. Vict., vol. xxiii., p. 114 (1910). The late Mr. Betche, in a note in the "National Herbarium," states "The mistake originated probably with Dr. Woolls, who enumerated *T. barbata* as a naturalised weed in his "Plants Indigenous to the Neigh. Sydney. In the same way we find the common "Stinking Roger" listed under the name *Tagetes glandulifera* Schrank. This should be correctly listed as *Tagetes minuta.*

Mr. C. T. White, Government Botanist, of Queensland, has transferred *Leptospermum abnorme* F.v.M., to the genus *Agonis.* I do not approve of this as in my opinion it has not the true characters of an *Agonis,* as I shall endeavour to show in a paper shortly to be published. In any case the name *brachyandrum* should have been taken up and not *abnorme*.

PAROPSIS BEETLE.

By Mary Fuller.

Early in April, 1922, I found four larvae on a gum-leaf at Freshwater. They were standing close together on the leaf with their heads towards the middle. The tips of their tails were turned up in the manner of saw-fly larvae. They were smooth and greenish-grey, faintly spotted with yellow—the heads were large and shining.

After feeding for a week the larvae crawled on to the sand, where they remained in a shrivelled state for four days, and finally came out of their larval skins as soft pink pupae. On the underside were seen the legs and wings curled up. The eyes and antennae were also distinct.

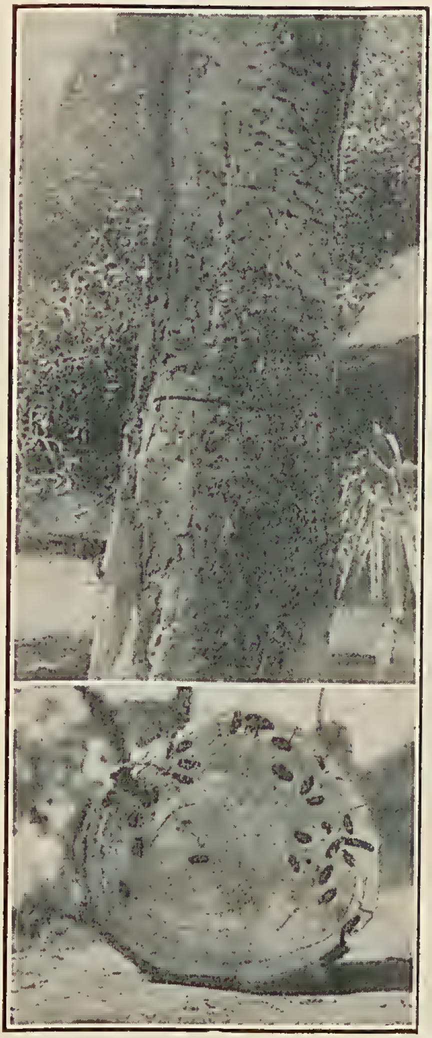
On the upperside the segmented abdomen was very noticeable. If touched the pupae moved the tip of their abdomen backwards and forwards as in the larval state.

One emerged on 27th May, and the other three on 28th. They were thick, round beetles with the elytra completely covering the wings and lapping over the body. Their heads were small and turned under—antennae slender and jointed. The whole of the head, thorax and wing-covers were of a bright orange-red, speckled with yellow. The legs were short and flattened at the ends.

HOW THE LARVAE OF THE GOAT MOTH CULAMA CALIGINOSA WORKS.

By Hilda M. Crispo.

In a far corner of our ground stood a fine specimen of *Angophora lanceolata.* Unlike most of its kind growing on the rocks about here, its trunk grew straight up for many feet before it sent out its twisty, gnarled branches. Evidently the struggle for existence had been keen, and, for a time, it apparently forgot to grow into its usual fantastical form. However, the race habit sooner or later asserts itself as it did in this case. For many years this relic of Gannon's Forest was the pride of its corner. Several eucalypts near by had been bored to death and removed, and this finally became the fate of the *Angophora.*



Top: Bole of tree, bark removed.
Bottom: Section of bole.

I first noticed the upper branches showing the usual signs of the borers' insidious work. The larvae were working too high up for anything to be done. Eventually they worked down until at last three parts of the circumference of the bole was a series of wide cracks filled with sawdust. So beautifully had the larvae done their work that it only required a little pressure and the outer bark came off clean, revealing the inner bark as you see it in the photograph. This, too, was partly eaten. It was riddled with oval holes, and here and there dull red larvae were found. Some were full length in a little rut of sawdust waiting for a new spurt of energy to fulfil this stage of their life-history; others just had a dark head poking out of their holes. These larvae were in various stages of growth; some were small and of a paler color, while others were nearing maturity. They were the larvae of the Goat Moth, *Culama caliginosa* which belongs to the family Cossidae. They feed on the sap in the tree, working in a downward direction.

The outer tunnels shown in the cross section photograph are not continuous. They are worked as follows:—The larvae worked in horizontally or obliquely for an inch or an inch and a half, worked downwards for a few inches, then worked to the surface of the inner bark again. Here they rest awhile until they are ready to bore in once more. Then they return to their little recess and continue their journey downwards, coming to the surface at intervals of varying lengths. Other excavations showed that the larvae on coming to the surface did not continue the old tunnels, but bored in an entirely new place, going in, down and to the surface again as described above. Then, again, I found that other holes extended in for only an inch or two and stopped. These methods of working would explain the reason why the bole is so studded with holes, and yet the cross section shows so few.

The inner tunnels shown in the photograph are continuous, and were made by the more mature larvae; these make long tunnels and pupate at the end of them. I traced their tunnels in for four or more inches, then down for two feet. Had the timber been cut in longer lengths, undoubtedly, I would have found them continue much longer. One enterprising larva tunnelled into the heart of the tree.

The cutting down of the tree evidently shortened the larva stage of those concealed in the tree. Through their food supply being cut off they were forced to pupate. This they did close to the top of the tunnels in the cut timber. Unfortunately, I only became aware of this fact through poking out the tunnels to test their length. I found, however, that they were an inch and a half long, and adhered to the sides of the tunnel.

The moth is a slate grey colour with fine black markings all over its wings.

CALLITHAMNION PLUMIGERUM.

By Thistle J. Harris.

This is a very delicate feathery seaweed, one of the most beautiful of our Australian types. It is classed amongst the Ceramiales of the Rhodophyceae (Red seaweeds). It may be seen growing on rock platforms and in tide pools where it is never left entirely exposed. Microscopic examination shows that it is made up of a series of relatively thick-walled cells with the cytoplasm somewhat contracted from the walls, that of each cell

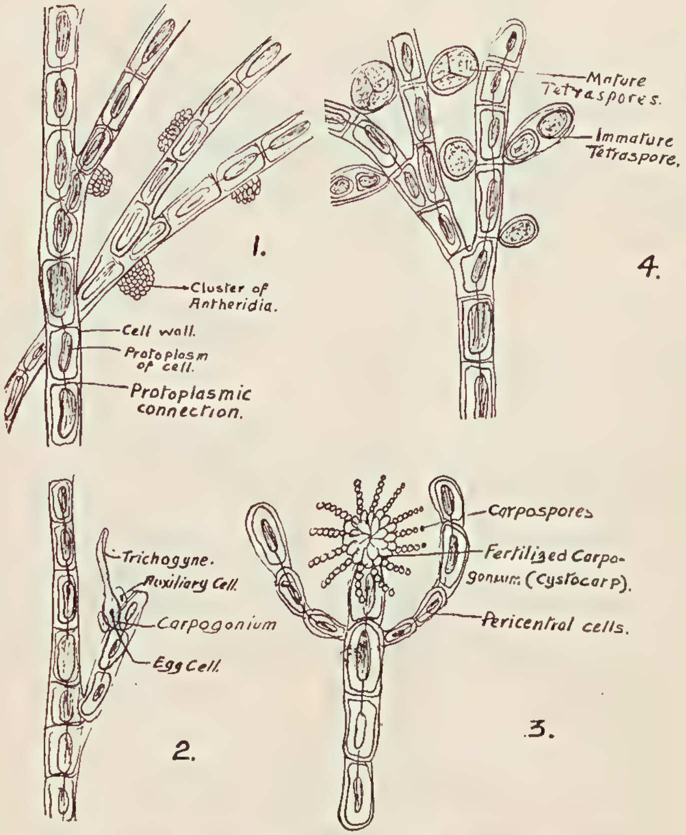


Fig. 1. Male plant. Figs. 2 and 3. Female plants.
Fig. 4. Asexual plant.

being joined to its neighbour by a strand of the same substance. The plant branches in a very regular manner, giving the feathery appearance and each branch grows by an apical cell. The entire plant is enclosed in a gelatinous sheath causing it to be difficult to manipulate unless mounted and dried immediately after collection.

The reproduction of this form is typical of the class. There are three distinct plants produced, male, female and asexual.

The male plants produce clusters of antheridia over the branches. These liberate naked spermatia, which have no cilia or motile bodies of any kind, and are carried along by the motion of the water.

The female plants produce a structure which is composed of two parts; a more or less spherical lower portion which contains the egg cell and an elongated portion known as the trichogyne. The portion containing the egg cell is known at this stage as the carpogonium. Two lateral auxiliary cells are also formed. When the egg cell is ready for fertilisation the trichogyne exudes an apparently attractive mucilage which attracts the spermatia. One of these spermatia enters the trichogyne, the envelope which the spermatium has by this time formed round itself and the wall of the trichogyne dissolving. The spermatium passes down the trichogyne and fuses with the egg cell. Fertilisation is now complete. The fertilised carpogonium is cut off from the trichogyne by a partition, and the latter structure, having accomplished its mission, withers away. Short branches are sent out from the carpogonium, which appear to fuse with the auxiliary cells, though there is no fusion of the nuclei. Each auxiliary cell divides by a transverse septum, and the upper part develops a number of carpospores. Thus two sets of fruits are formed from each female fructification. These structures together are known as the cysto-carp and the individual spores formed are called the carpospores. This method of reproduction is typical of *Callithamnion*. On germination each carpospore gives rise to a plant which bears asexual tetraspores, and thus, it is seen, there is a very definite and regular alternation of generations, in the species.

THE "LIZARD ROCK," MOSMAN.

By Thos. Steel.

In the "Mosman Daily" there appeared the following paragraph by "Observer" descriptive of this curious rock at the Cremorne wharf in Mosman Bay:—

"Australians are proud of the natural beauties of their country, of the mountains and caves with their curious sculpture, but I wonder how many of the thousands of passengers travelling to and fro on the Mosman ferries have observed the huge lizard which nature has fashioned on the top of a rock just at the Cremorne landing. He appears to have crept partly forth from his retreat under a smaller rock, showing his head, shoulder and fore arm. His expression varies, though the mouth always wears a cruel look; eye and nostrils are well defined. Sometimes, especially on grey dull days, he seems to be on the alert for prey, watchful and sinister; but in bright sunny weather he is basking in the sun, indifferent to the clang of the ferry boat, or the hurrying footsteps of the many passers by. Nature having been so kind and gracious in giving Mosman or Cremorne this specimen of her wondrous art, and placed as it is, right at one of the doorways of our pretty bay, surely it is up to the residents of the suburb to have steps taken to preserve it for all time against the inroads of the future. I would suggest that a strong ornamental fence be placed in position round the sides and back of the rock, which should be known as the 'Lizard' or 'Goanna Rock.'"

Under the kind guidance of Mr. Finckh a small party visited the bay and inspected the rock, and also another most interesting example of nature's sculpture. The "Lizard Rock" can be readily seen from the steamer, being situated at the left hand corner of the wharf. The head is pointing towards the harbour, and shows the eye and nostril very distinctly.

Leaving the steamer at the Mosman terminus, our guide took us round the top of the bay, where there lie a couple of blocks of sandstone, just on the edge of the embankment, which bear a striking resemblance to sections of petrified tree trunks. These objects are well worthy of inspection by our members.

VISIT TO TARONGA PARK.

Those who allowed other engagements to prevent their attendance at the excursion to Taronga Park on Saturday, 10th February, missed a pleasant and instructive afternoon's entertainment. About 30 members were present, under the leadership of Mr. A. S. le Souef.

Each visit one pays to this picturesque spot seems to bring home more forcibly the fact that the greatest care has been taken to preserve the natural beauties of the surroundings. The great bulk of the natural vegetation in the park remains in its original position, and many native trees and shrubs have been added. Of the trees, practically all growing there are native, it being possible to number the few foreign ones on the fingers of one hand. Of course, most of the smaller vegetation—that used in the flower beds—is exotic, and with these plants some fine effects are produced. The cannas especially are very showy at the present time, and the small heliotrope-coloured lantana (*L. Sellowiana*) made a good display in places.

In the use of native trees, much advantage has been taken of the different tints of green, our lighter greens, such as the geebungs (*Persoonia*) and native cherry (*Exocarpus*), being tastefully interspersed with the darker greens, like *Phyllanthus, Flindersia*, etc. *Phyllanthus Ferdinandi* is certainly a tree which should command more attention in our gardens.

The encouragement of native trees has naturally given great encouragement to native birds; and these do excellent work in keeping down pests (scale insects, etc.). In fact, according to Mr. Le Souef, the birds have now reached a stage when they render it possible to do away with the services of one man for spraying, etc., thus saving the institution an expense of about £200 a year. A number of nests of "twelve apostles" (*Struthidea cinerea*) were observed in one tree, built by the progeny of eight specimens of this bird originally released in the park.

As is well known, a wonderful success has been made, in designing the present Zoo, of the scheme for exhibiting the animals as far as possible in what appear to be natural surroundings—without bars or cages. And in this respect the effect is particularly good immediately one enters the park at the lower gate. To look up from the path on the right at the bears apparently at liberty amid picturesque surroundings of rock and tree is especially pleasing. The same applies to the peep one gets of the old male elephant from near the parrot house; in the distance through the trees he appears quite at liberty, though he is actually not yet "civilised" enough to be allowed out of his enclosure. The tree kangaroo is a very interesting recent addition to the gardens; the particular specimen comes from Dutch New Guinea, and is a very rare animal (not yet named), looking like a half-way stage between a wallaby and an opossum, the large hind legs of the former being much reduced for climbing purposes.

Regarding birds, Mr. Le Souef disclosed the interesting fact that attention has latterly been given to Australian birds by professional breeders, and much success has recently been attained in France with the pretty little warbling grass parrot or budgerigar (*Melopsittacus unaulatus*). By artificial selection a number of variations from the original vivid green have already been obtained—such as blue, blue and white, olive, and yellow. In the neighbouring cage was the curious little African wydah bird, with its very long and heavy looking tail feathers. One would imagine such an appendage to be a particular handicap to the bird in a strong wind or in time of danger when seeking safety in quick flight.

At four o'clock, an adjournment was made across the tram line into Ashton Park—a beautiful spot, where all the natural growth of shrub and tree has been left untouched (may it long remain so!). Afternoon tea was "discussed" on a picturesque ledge of rock overlooking Taylor's Bay, after which—the hearty thanks of the party having been tendered to Mr. Le Souef—the members again walked through the gardens before dispersing.

M.S.B.

NOTES AND COMMENTS.

BULLINULA ZICZAC.—A beautiful little mollusc of the family Aplustridae, collected on January 20th, at Long Reef, Dee Why. The shell white with pink stripes, is only three-eighths inch long. The well developed foot and head region of the living animal is of a translucent white with a margin of light blue, iridescent and glistening. The animal swims actively and is certainly worth looking for.

ROSE WINTER.

MR. GALLARD'S EXHIBITS.—At recent meetings Mr. Gallard showed several specimens of entomological interest as follows:—

LETO STACEYI.—The bent-winged swift moth. Bred out on March 4th and by the morning of the 6th had laid 180 eggs. These are white when first laid, but soon turn to a lovely velvety black. They are round, about the size of common threading beads. The larva was from a Blue Gum tree in Gosford district.

CODLIN MOTH.—A tube containing two dozen eggs laid in clusters on inside of tube. Some had hatched, in others the embryo was plainly visible. This is the first time I have seen Codlin eggs laid in clusters like this, in captivity. The eggs are usually hard to find and few people ever see them.

ICERYIA PURCHASI.—The cottony cushion scale. A large tube containing a colony of about 150 adults with a number of developing scales partly grown. These had been thickly covered by small brown ants with a felted covering of broken leaves and chewings stuck together. When covered in this way several of our sucking insects can survive the severity of winter. The ants touch the scale insects with their antennae and in turn these exude droplets of "honey dew," which is at once sucked up by the ant.

MONOPLEBUS CRAWFORDI.—The large mealy bug. An exhibit showing the red larvae crawling out of the old dried-up body. About 200 had emerged and a large number were to follow. The male of this insect is known as the Bird of Paradise fly, on account of the long tuft of white fluff which extends from the anal end like the tail of a bird.

LEMNA ARRHIZA.—At the February meeting Mr. Finckh exhibited this interesting free floating aquarium plant. He collected it originally some 15 years ago in a Chinaman's garden at Rushcutter's Bay, Sydney, and has kept it going ever since.

Notes on E. BOTRIODES.—Viewed from the waters of Broken Bay amongst the north-eastern spurs that lie below the rocky escarpment which marks the edge of the rough tableland of Kuringai Chase, one may notice the large foliage and rich green colour of *E. botriodes* as they contrast with the sober tinted and narrow-leaved Spotted Gums. The aborigines called it Bangallah since corrupted, and still described locally as Bangally. The trunk has a brown, thick fibrous bark, altering on the limbs to a smooth grey covering of a thin, firm nature. It usually grows in choice positions as regards quality of soil and seems to dispute with the Casuarinas for possession. The timber is a light red colour, and greatly esteemed for its durability, being valuable for building, fencing, etc., it forms a handsome tree.

C. A. HALL.

Mr. W. W. Froggatt.—The retirement from his official position as Government Entomologist of Mr. Froggatt is a notable event in local scientific circles. During the whole currency of the life of our Society, Mr. Froggatt has indeed been guide, philosopher and friend to all of us. His unrivalled knowledge of bush life, of our birds and insects, has been freely at the disposal of every one interested and he has been ever ready to come forward with papers and lectures, greatly to the advantage of our members. We all most heartily join in wishing Mr. Froggatt every prosperity in his retirement. His retirement does not mean the cessation of work, for with the greater leisure which freedom from exacting official duties will give, Mr. Froggatt will follow with increased zest his life work. His heart is in his work and we look forward with pleasure and interest to the publication of the works on which he is engaged.

ED. "A.N."

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

June 5th.—The President (Mr. Shiress) in the chair, and a good attendance. Mr. Lippmann and Misses O'Hanlon and Devis were duly elected members.

Master Howell showed *Persoonia salicina* thickly infested with galls of *Apiomorpha munita* resulting in these being dwarfed in size, none of them reaching the usual dimensions. Miss Crispo branchlets of *Casuarina Cunninghami* with both male and female inflorescences, and also galls of *Cylindrococcus spiniferus*.

Mr. A. Chisholm gave an interesting address on birds, dealing especially with their nesting habits. He divided them into three classes, those which nest on the ground, in forks of trees and those which build suspended nests. The lantern slides with which the lecture was illustrated showed the patience and skill of the photographer. The slides of jungle nests were particularly fascinating, while those which gave some idea of the beauties of Queensland National Park were also much appreciated. Many instances on the part of the birds to be friendly were adduced. The evolution of nest building was exemplified by a series of slides, from the few sticks of the Torres pigeon to the elaborate structures of such birds as the lyre bird, robin, etc. On the motion of Messrs. Froggatt and Finckh a cordial vote of thanks was carried.

July 3rd.—The President (Mr. Shiress) in the chair, and there was a good attendance. A paper by Rev. Archdeacon Haviland was read, on "The Castlereagh." Mr. Cheel, on behalf of Rev. H. Rupp, read a paper entitled "Notes on the habits of certain Orchids."

Mr. Forster exhibited *Rapanea variabilis* collected at the excursion to Lugarno Ferry, also 23 paintings of plants collected at the same excursion. Mr. Finckh gave an interesting account of the tameness of a shrike thrush (*Colluricincla harmonica*) which took food from his hand in his garden at Mosman.

Mr. Froggatt then gave a fine lecture on "White Ants," dealing with classification, habits and depredations, illustrated by a series of excellent slides. The wonderful intelligence displayed by these insects was stressed, especially the manner in which the workers open a way for the flight of the winged males and females. On the motion of Messrs. Stead and Cheel, a hearty vote of thanks was carried.

ANNUAL MEETING.

August 7th, 1923.—The President (Mr. Shiress) in the chair. The usual official reports were submitted and adopted, and the election of office-bearers carried out. The list of office-bearers is printed on inside cover.

Mr. Shiress then delivered his address, the subject chosen being "The Welfare of the Society." A hearty vote of thanks to the retiring President for his address and for his able conduct of the affairs of the Society during his term of office was carried by acclamation. The new President, Mr. E. Cheel, was then installed in the chair, and a discussion by the President and several members, on Wattles, took place.

ANNUAL REPORT OF COUNCIL FOR 1922-1923.

The various activities of the Society have been well maintained during the year. At the last annual meeting, Miss Brewster, the retiring President, read a thoughtful and interesting paper on the "Life-History of the Brown Seaweed (*Phyllospora, comosa*)," giving evidence of careful research work and skill.

The Society has suffered the loss of two of its members, Mr. C. Hamblin, who died in November of last year, and on Saturday last one of our oldest members and the first President of the Naturalist's Society, in 1912, passed away. Since 1912 Mr. E. S. Edwards, M.A., held office continuously, as President, again in 1918-1919, as Hon. Secretary for a long period, and as a member of Council. His place is not one that can be readily filled, he had the interests of the Society much at heart, and was an able and fluent speaker.

C. M. LE PLASTRIER, Hon. Secretary.

PRESIDENTIAL ADDRESS.

Delivered August 7th, 1923.

By D. W. C. Shiress.

I had intended giving you a paper on the value of our local trees, shrubs, and flowering plants, from both an economic, as well as an aesthetic standpoint, but that can be held over for some future date, and, although that might possibly be of more interest to some of you than what I purpose saying, still as your President I feel it my duty to speak of what is in my mind, and I hope to be brief on the subject of my address "The Welfare of the Naturalists' Society of New South Wales."

I have always held the view that the President as the Chief Executive Officer of the Society, should place before the members a review of the year's work. It is the right of members to know exactly how matters stand, and it is just as necessary for a Society such as this to review its position as it is for a company of business men, in order that it may readjust itself where necessary.

Financially our position is sound, but if you take the trouble to look backwards you will find that the Society has been marking time for quite a long period, but thanks to our worthy Hon. Treasurer, Mr. Finckh, and to his foresight and zeal, we can sleep in the assurance that our reserve fund is intact, but are we forever to mark time? That is the question we have to face and decide to-night.

Now before I go any further I am going to say that it appears to me we are too much inclined to lean on the Council for everything. That the fact the Society is considered an educational one is accepted too literally, and that if we are to continue the good work we must look things squarely in the face, and accept our responsibilities and take our share of the burden. No one in particular is to blame, the fault lies so far as I can see in the fact that we have never had a concrete object in view, and in order to test this I am going to offer each and every one of you an opportunity for work and that work to fit in with his own particular hobby or line of thought. The fact that we annually enrol a lot of new members but fail to hold them is proof that there is something lacking in our methods. I have gone carefully through the proceedings for the past twelve months, and find that we have had the usual series of lectures, one or two by student members, which were full of interest. Our outings have been well selected and fairly well attended, and so far as I can see the traditions of the Society have been well maintained. An Exhibition was held on the 8th September last, which was considered to be our debut into the limelight of public favor, and, although that exhibition was undoubtedly successful from a spectacular standpoint, the public did not rush to enrol under our banner. Now the point which naturally arises is—What interest have we in common with the public? Don't you think we live too much to ourselves, and that if we are to make the progress that in common fairness is due to those foundation members who are even now the backbone of the Society, we should march with the times and take our place in the van of those who are striving to preserve and protect our native flora and fauna. Why, to me it appears to be our very life and breath, the mainspring of our existence, and yet as a Society we are unknown. In Victoria and South Australia the Field Naturalists' Society is a branch of the Royal Society, in the latter State it has a committee for the protection of its native fauna and flora, and also I believe a Parks Committee and it is along these lines that I believe we can develop, and I appeal to you to-night firstly as Field Naturalists and secondly as Australians to pledge the Society to the protection and preservation of our flora and fauna, that wonderful gift that has come down through the ages uncontaminated by outside influences, the most wonderful and unique in the world, and so full of interest that the eyes and hands of the scientific world are, and have been gloating in its treasures, for some years past, filching our heritage from us. Now the one sure way to do this is through our school children—and here we have the example of that wonderful body—the Gould League of Bird Lovers, who have done such valuable work through the influence of the children. We have the personnel. The question is, have we the will? That of course is for you to decide, but I feel so sure of it myself that I suggest we form two committees to start with—one for the protection of our native flora and fauna, and the other to embrace forestry, agriculture and horticulture, whose main duty will be to prepare suitable papers for distribution amongst the schools and in connection with this I would point out that in the New Director of Education the country has a man with an open mind and whose first consideration will be the well-being of the children, and one, I feel sure, who if this matter is properly placed before him will welcome papers on natural history subjects with the impress of the Naturalists' Society.

You are all aware what forestry means to the country, and that at last the Government has given a tardy recognition to it, but has failed to grasp its fundamental elements, and how essential to the welfare of the country the preservation of our trees and their scientific cultivation really is, and that we should be doing what America. France, Italy, Spain, Japan, etc., are; where the forestry question is of such paramount importance that scientists of all classes are investigating our timbers, selecting and cultivating them.

It is a well known fact that S. Africa with our wattles has ousted us out of the market for tannin—Spain and Italy are threatening to do the same with Eucalyptus oil, and the next thing one will hear of is that we are importing Australian hardwood from America. It is apparently useless to turn to the Government, and here again is work set out for us to inculcate into the minds of the children the value of forests, their influence on the rainfall and climate, the baneful effects of setting fire to the bush, which alas is not alone a boyish prank—the fact that our gum trees are sought for all over the world for their timber, as also for their chemical properties. That the gum trees are necessary for the protection of the birds, etc.

Experience has shown even the casual railway traveller, that almost any part of our country which has been denuded of trees if left alone will soon re-afforest itself, so that there is not the necessity for planting large areas as they have to in other countries, and it seems a woeful state of affairs that attention is not concentrated on the selection and cultivation of our native timbers instead of wasting precious time and money on experimenting with *Pinus insignis* and American soft woods. Have we no pine? The Richmond River pine lined many a pocket, and is still being sought for, and will be until it is extinct. No Cedar, no Acacia, melanoxylon considered the finest cabinet wood in the world, no *Grevillea robusta*. The fact of the matter is we haven't even got an Australia yet, and the sooner we set to work to cultivate it the better. Have it taught in our schools, and finally the University, for with the rapid increases in insect pests, we shall be in a sorry plight indeed unless something is done to Australianise our institutions and turn out scientists with a thorough working knowledge of Australian entomology and botany.

I could have elaborated on this, but you can read between the lines and fill up the vacant places. The work is of great magnitude, but it offers an outlet for those of our members who are specialising—work for the chemist, artist, photographer, orator, work for all and a solution of our membership problem. Just think it out with the map of Australia in front of you, the map of this vast and glorious country of ours, and thank the powers that be, and the men who so nobly died for it, that it is your privilege also to do something for the land of your adoption, if not your birth.

THE FLORA OF MARRANGAROO, COUNTY OF COOK.

By E. C. Chisholm, M.B., Ch.M., R.A.O.U..

1920-1922.

Marrangaroo is situated, in the County of Cook, on the Main Western line, 100 miles distant from Sydney as the railway runs, and about 75 miles by air line from the coast, at an elevation of 3,076 feet above sea level.

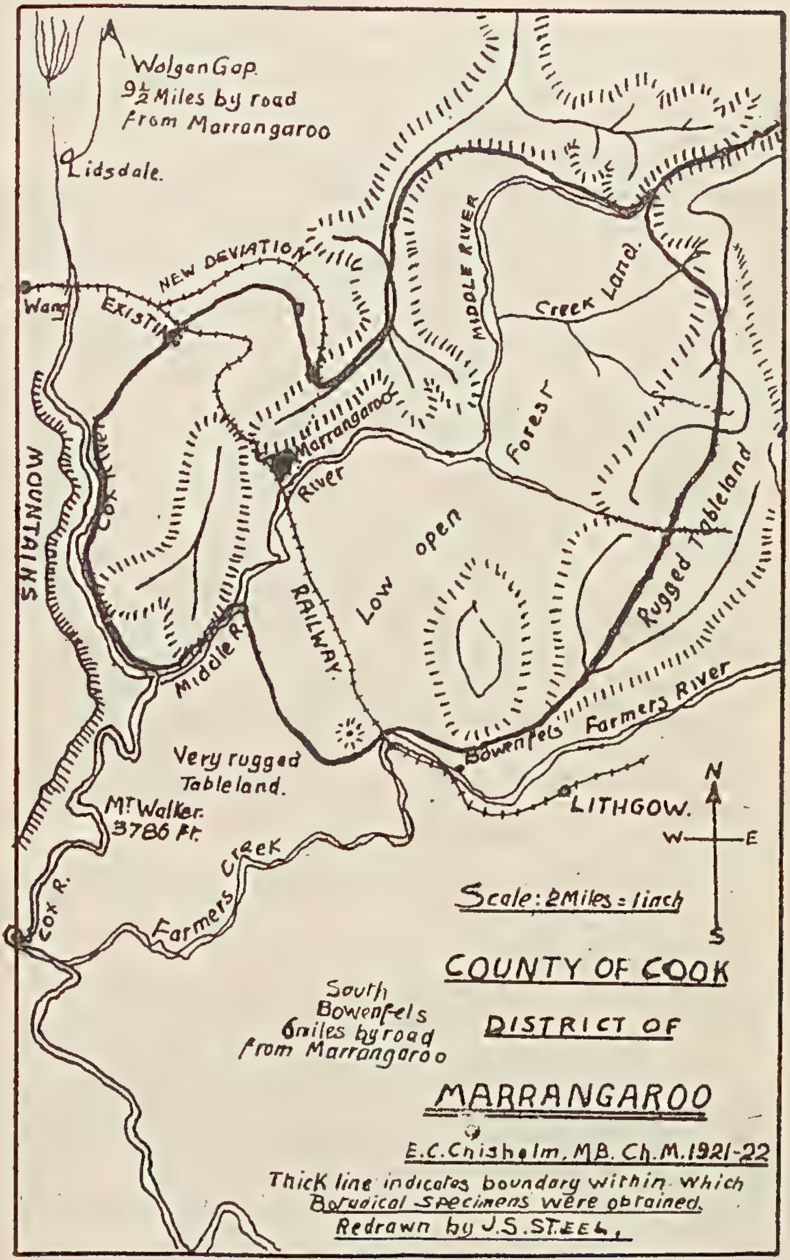
It lies in a depression with hills all around varying in height from roughly 600 to 700 feet above the lower level. This lower level country is undulating and covered by open forest. The distance from the hills on the west to those on the east is from two to three miles, and north and south from three to four miles. Middle River, which has its origin about seven miles in a nor-easterly direction, drains this area and then runs its course through the hills to Cox's River, about four miles away in very rugged country, the junction being almost due south.

Temperature.—I have not known this over 90 Fh. in the summer, but twice have recorded it as low as 16°Fh. in the winter.

Rainfall.—Between 40 and 50 inches per annum.

I take this opportunity of recording my great indebtedness to the Director of the Botanic Gardens, Mr. J. H. Maiden, for his help in getting the specimens identified for me and for his kindly courtesy at all times, and also to Mr. W. F. Blakely, Botanical Assistant, National Herbarium, for his valuable assistance and many helpful hints and by whom the main work of identification has been done.

The distribution of the eucalypts is interesting. On the lower level forest country are found *E. rubida, E. maculosa, E. Dalrympleana, E. coriacea, E. stellulata, E. aggregata* (with the last


Wolgan Gap.
9½ Miles by road
from Marrangaroo
Lidsdale.
Wang
NEW DEVIATION
EXISTING
MOUNTAINS
Cox R.
Middle R.
MIDDLE RIVER
Creek Land.
Forest
Marrangaroo
Marrangaroo
River
RAILWAY.
Low open
Rugged Tableland
Bowenfels
Farmers River
LITHGOW.
Very rugged
Tableland.
Mt. Walker.
3786 Ft.
Farmers Creek
Cox R.
N
W
E
S
Scale: 2 Miles = 1 inch
South
Bowenfels
6 miles by road
from Marrangaroo
COUNTY OF COOK
DISTRICT OF
MARRANGAROO
E.C. Chisholm, M.B. Ch.M. 1921-22
Thick line indicates boundary within which
Botanical Specimens were obtained.
Redrawn by J.S. STEEL.

especially along the creeks), *E. vitrea, E. fastigata* (the last in the gullies), *E. dives, E. Stuartiana* var. *parviflora,* and *E. viminalis* mostly on the higher levels on sides of hills, while *E. radiata* follows course of creeks out of the gullies into the open land where it stops, while *E. Sieberiana, E. macrorrhyncha, E. eugenioides, E. altior, E. piperita, E. micrantha, E. Blaxlandi,* and *E. maculosa* will be found on the top and high up the hill sides. *E. goniocalyx, E. elaeophora* and *E. pulverulenta,* are not about Marrangaroo proper, the nearest place I found them is South Bowenfels, six miles away south. *E. melliodora* grows in granite formation on the hills near Cox River within the four mile radius. I have recorded only 16 flowering so far, viz.:—

E. stellulata, March, April.
E. dives, October-November.
E. Sieberiana, November.
E. coriacea, November.
E. micrantha, December, January.
E. Stuartiana var. *parviflora,* January, February.
E. piperita, January.
E. viminalis, February, March, April.
E. macrorrhyncha, March.
E. Dalrympleana, April, May, June.
E. melliodora, February, March.
E. rubida, August.
E. radiata, November.
E. aggregata, April.
E. Kybeanensis, March.

Flowering at Katoomba (30 miles east).
E. stricta, December.
E. fastigata, January.
E. altior, February.
E. eugenioides, February.

An interesting form is *E. Kybeanensis.* I have only seen one specimen of this. A tree about 25 feet high and 11 inches in diameter at the butt, branching at 15 inches from the ground into five main stems averaging four inches in diameter where they leave the trunk. The bark at the base of the trunk is rough and in coarse flakes, becoming ribbony on the branches. Leaves long and narrow. Fruit truncate, rounded, with very short pedicel; valves inserted. The fruit resembles that of *E. eugenioides.* This tree was growing on low swampy land in company with *E. stellulata, E. rubida, E. coriacea, E. aggregata.* It had young bud in September, which were narrow and pointed.

An interesting hybrid Eucalyptus.—I have recorded for Marrangaroo. It appears to be a cross between *E. micrantha* and *E. piperita,* which I later showed to Mr. W. F. Blakely. It is growing about 500 or 600 feet above the surrounding country on the top of a ridge in company with *E. piperita, E. micrantha, E. Sieberiana,* and *E. eugenioides,* which are in its immediate vicinity. Height 40 to 50 feet; diameter of trunk at butt 3 feet from the ground. 18 to 20 inches. Barrel extends for 8 or 9 feet, then branches. Bark on main stem to branches of typical *E. piperita* kind. From the top of barrel to end of branches smooth, creamy white with purplish mottling like that of *E. micrantha.* Adult leaves narrow lanceolate, and somewhat falcate, of same shape and size as those of *E. micrantha,* but differing in not being glaucous and of a darker green; the venation of both corresponds closely, average size of leaf 4½ x 3/8 inches. Sucker leaves at 16 to 18 feet from the ground, slightly broader, but lanceolate, lighter green, and inclined to glaucousness. Fruit slightly urceolate, but having a broader rim than in *E. piperita,* and not inclined to pipe, narrower at the mouth than the fruit of *E. micrantha.* The fruit is slightly smaller than that of *E. piperita* and approaching more nearly to that of *E. micrantha.*

The flowering season of the *Acacias*:—

Acacia discolor, May to September.
,, *vomeriformis,* June to September.
,, *juniperina,* July to August.
,, *buxifolia,* August, September.
,, *Hamiltoniana,* July, August.
,, *Dorothea,* August, September.
,, *dealbata,* July to September.
,, *melanoxylon,* August to January.
,, *penninervis* var. *falciformis,* November, December.
,, *intertexta,* December to February.

These months are inclusive.

Of the Proteaceae the only Grevillea's here are *G. acanthifolia,* and *G. laurifolia*; and the Waratah is absent. Though the western boundary of this flower is only about 8 miles east, by air line; *Xylomelum* and *Lambertia* are also absent, but seem to be on the boundary line of the eastern and middle western country of the State, as the country opens out west from here, the Cox's River being the last eastern water. One sees the dividing line with the fauna, too, e.g., this seems to be the western limit of the Lyre birds for they are very rare here; I have only seen one, and that was on the eastern side.

The flora I have recorded for Marrangaroo, was collected from an area bounded on the west by Cox's River; on the east by the high land on top of a chain of hills; to the south by Bowenfels, and to the north about three miles. So that roughly the area would have a radius of 4 miles in every direction, but one, viz.: N.E., where it would extend about 7 miles to the head of Middle River.

In the case of Wolgan Gap, which is out of this area, I have put a note against *Brachychiton populneus,* the only plant recorded for that place, which is not here, and the same for South Bowenfels with the three eucalypts mentioned.

Of Filices. *Dicksonia antartica,* is absent.

THE FLORA.

Sub-division Pteridaphyta.

- POLYPODIACEAE.
  - Asplenium flabellifolium.
  - Blechnum cartilagineum.
  - Cheilanthes tenuifolia var. Sieberi.
  - Adiantum aethiopicum.
  - Histropteris incisa.
  - Pteridium aquilinum.
- GLEICHENIACEAE.
  - Gleichenia circinata.
  - „ flabellata.
- OSMUNDACEAE.
  - Todea barbara.

Sub-division Angiospermae.

Class MONOCOTYLEDONEAE.

- CYPERACEAE.
  - Cladium Gunnii.
  - Gahnia psittacorum.
  - „ Sieberi.
  - Caustis flexuosa.
- LILIACEAE.
  - Bulbine bulbosa.
  - Thysanotus tuberosus.
  - Dichopogon strictus.
  - Arthropodium paniculatus.
  - Tricoryne elatior.
  - Stypandra glauca.
  - „ caespitosa.
- HAEMODORACEAE.
  - Haemodorum planifolium
- IRIDACEAE.
  - Patersonia sericea.
  - „ glabrata.
- ORCHIDACEAE.
  - Dipodium punctatum.
  - Thelymitra ixioides.
  - „ venosa.
  - Diuris elongata.
  - „ maculata.
  - „ aurea.
  - Microstis parviflora.
  - Pterostylis coccinea.
  - Eriochilus autumnalis.
  - Caladenia dilatata.
  - „ carnea.
  - „ alba.
  - „ testacea.
  - Glossodia major.
  - „ minor.

Class DICOTYLEDONEAE

- CASUARINEAE.
  - Casuarina suberosa.
  - „ paludosa.
- URTICACEAE.
  - Urtica incisa.

PROTEACEAE.
Petrophylla pedunculata.
„ pulchella.
Isopogon anemonifolius.
Conospermum ericifolium.
Persoonia ferruginea.
„ salicina.
„ linearis.
„ virgata.
„ myrtelloides.
„ chamaepeuce.
Grevillea laurifolia.
„ acanthifolia.
Hakea saligna.
„ sericea.
„ microcarpa.
„ dactyloides.
Lomatia longifolia.
„ silaifolia.
Banksia ericifolia.
„ spinulosa.
„ marginata.
„ paludosa.
SANTALACEAE.
Exocarpus cupressiformis.
„ stricta.
Leptomeria acida.
Omphacomeria acreba.
LORANTHACEAE.
Gaiadendron ligustrina. The most westerly locality.
Loranthus pendulus.
POLYGONACEAE.
Polygonum hydropiper.
CARYOPHYLLACEAE.
Stellaria pungens.
RANUNCULACEAE.
Clematis glycinoides.
Ranunculus lappaceus.
LAURACEAE.
Cassytha melantha.
DROSERACEAE.
Drosera peltata.
SAXIFRAGACEAE.
Quintinia Sieberi.
PITTOSPORACEAE.
Marianthus procumbens.
Bursaria spinosa.
Billardiera scandens.
CUNONIACEAE.
Callicoma serratifolia.
ROSACEAE.
Rubus parvifolius.
Acaena ovina.
LEGUMINOSAE — Mimosoideae.
Acacia juniperina.
„ vomeriformis.
„ penninervis var. falciformis.
„ Hamiltoniana.
„ buxifolia.
„ melanoxylon.
„ intertexta.
„ Dorothea.
„ discolor.
„ dealbata.
LEGUMINOSAE — Papilionatae.
Oxylobium trilobatum.
Mirbelia grandiflora.
Gompholobium Huegelii.
„ uncinatum.
Daviesia latifolia.
„ corymbosa var. mimosoides.
„ ulicina.
Pultenaea pycnocephala.
„ scabra.
„ microphylla.
„ aristata.
„ subspicata.
Dillwynia ericifolia.
„ „ var. phylicoides.
„ floribunda.
Bossiaea prostrata.
„ buxifolia.
Hovea linearis.
„ heterophylla.
Indigofera australis.
Hardenbergia monophylla.
GERANIACEAE.
Geranium dissectum.
Eroduim cicutarium.
„ moschatum.
RUTACEAE.
Boronia microphylla.
„ anemonifolia (S. Bowenfels)
Zieria cytisoides.
Eriostemon obovalis.

TREMANDRACEAE.
Tetratheca ericifolia.
POLYGALACEAE.
Comesperma volubile.
„ ericinum.
EUPHORBIACEAE.
Phyllanthus thymoides.
Amperea spartioides.
STACKHOUSIACEAE.
Stackhousia lineariifolia.
SAPINDACEAE.
Dodonea cuneata.
„ boroniaefolia.
„ multijuga.
RHAMNACEAE.
Pomaderris elliptica:
„ phillyraeoides.
„ ligustrina.
STERCULIACEAE.
Brachychiton populneus (Wolgan Gap).
DILLENIACEAE.
Hibbertia acicularis.
„ serpyllifolia.
„ linearis var. obtusifolia.
GUTTIFERAE.
Hypericum japonicum var. gramineum.
VIOLACEAE.
Viola betonicifolia.
„ hederaceae.
Hybanthus filiformis.
THYMELAEACEAE.
Pimelea linifolia.
MYRTACEAE.
Eucalyptus stellulata.
„ coriacea.
„ vitrea.
„ radiata.
„ fastigata.
„ dives.
„ Blaxlandi.
„ macrorrhyncha.
„ eugenioides.
„ piperita.
„ altior.
micrantha.
„ Sieberiana.
„ melliodora.
„ rubida.
„ maculosa.
aggregata.
„ goniocalyx (S. Bowenfels).
„ pulverulenta (S. Bowenfels).
„ elaeophora S. Bowenfels).
„ Stuartiana var. parviflora.
„ viminalis.
„ Dalrympleana.
„ Kybeanensis.
Leptospermum flavescens.
„ „ var. obovatum.
„ scoparium.
„ arachnoideum
„ lanigerum.
„ parvifolium.
„ attenuatum var. pendulum.
„ myrtifolium.
Kunzea parvifolia.
„ corifolia.
Callistemon Sieberi.
Calycothrix tetragona.
OENOTHERACEAE.
Epilobium glabellum.
ARALIACEAE.
Tieghemopanax sambucifolius.
UMBELLIFERAE.
Trachymene ericioides var. thymifolia.
„ Billardieri.
EPACRIDACEAE.
Styphelia strigosa.
„ lanceolata.
„ microphylla.
„ virgata.
„ mutica.
„ ericoides.
„ Fraseri.
Monotoca elliptica.
„ scoparia.
Brachyloma daphnoides.
Epacris reclinata.
„ paludosa.
„ microphylla.

,, pulchella.
,, onosmaeflora.
Dracophyllum secundum.
LOGANIACEAE.
Mitrasacme polymorpha.
Logania floribunda.
GENTIANACEAE.
Erythraea australis.
CONVOLVULACEAE.
Convolvulus erubescens.
Dichondra repens.
LABIATAE.
Mentha saturejoides.
Ajuga australis.
Brunella vulgaris.
SOLANACEAE.
Solanum aviculare.
SCROPHULARIACEAE.
Veronica perfoliata.
,, Derwentia.
Euphrasia Brownii.
PLANTAGINACEAE.
Plantago varia.
RUBIACEAE.
Coprosma hirtella.
Opercularia diphylla.
Pomax umbellata.
CAMPANULACEAE.
Lobelia gibbosa.
Isotoma axillaris.
Wahlenbergia gracilis.
GOODENIACEAE.
Goodenia bellidifolia.
,, hederacea.
Dampiera Brownii.
,, stricta.
Brunonia australis.
CANDOLLEACEAE.
Candollea serrulata.
,, linearis.
COMPOSITAE.
Olearia myrsinoides.
,, asterotricha var. parvifolia.
,, ramulosa (with blue flowers).
Calotis cuneifolia.
Lagenopnora Billardieri.
Brachycome discolor.
,, multifida.
Craspedia Richea.
Podolepis acuminata.
Leptorrhynchos squamatus.
Helichrysum scorpioides.
,, rutidolepis.
,, lucidum.
,, apiculatum.
,, diosmifolium.
Helipterum anthemoides.
,, incanum.
Gnaphalium japonicum.
,, purpureum.
Erechites arguta.
,, mixta.
,, quadridentata.
Senecio velleioides.
,, dryadeus.

CHANGING PLANT NAMES.

ERRATA.

In the article above by Mr. E. Cheel in last issue, p. 106, a transposition of a line occurred. The seventh line should read on after the third line; and the word "Wiksstroemia" in the third line should read "Wikstroemia."

Transpose the words "by Smith in 1797" from 5th line top to 5th line from bottom.

6th line from top (p. 106) should read on to 8th line.

THE CASTLEREAGH.

By Archdeacon Haviland, Coonamble.

The Castlereagh district has, at times, been brought much before the public in song and yarn; but they only who have lived on its banks and plains, are aware of the weird magnetism of its environments which seems to have a "pull" something akin to the "Mulga Fever" further back, upon its settlers. Rich in both fauna and flora, it has a field of interests mostly its own; the stream, sand-covered, as if to keep out the dust from its hidden waters, rises by many driblets somewhere or anywhere amidst the most ancient of Australia's climbs—the Warrumbungles; a course of mountains of mostly basaltic formation, and originally a continuous spur of the Liverpool Ranges, rising sheer-headed and forbidding, with only needle points and organ pipes to interpret the effects of millenia of weathering; from such haunted abodes emerges this river, at one part at least of which you can cross over and yet be on the same side as that from which you had started; a riddle which is frequently offered to the bewildered visitor. Be it now sand, now water, it had apparently a difficulty in finding a course over the level plains, and thus for two-hundred miles slowly staggers along till it enters the waters of the Barwon, near Walgett. Whether on the hills or along stretches of plain, bird life serenades the bushman with tones of unmatched purity and tune. There the Emu and Kangaroo vie with each other in leg strokes, and the Brolgas (*Antigone*) gracefully bow their courtesies to the passing traveller, while the Kookaburra ridicules the furtive attempts of the drought-stricken settler. The "Jacky Bird's" "Don't Hit So Hard," and the "Diamond Dove's" "Do, Do," the melodious bush Canary and the ubiquitous "Pee Weet," the mischievous "Bower Bird," which carpets its hall at somebody else's expense, and the "Twelve Apostles'" "Much Ado About Nothing," all break the monotony of the otherwise everlasting stillness and turn an otherwise weird sameness into such a variety in the way that only unaided Nature knows how. Yet, amidst all Nature's witnesses, the flora is not second in the adornment of hill and plain; there the "Darling" and "Wilcannia" Lilies (*Crinum* and *Calostemma*) contrasting their whites and yellows star the grassy canvas, and the "Everlasting Daisies" with their snowy spreads, relieve the earthy acres; the "Bachelor's Buttons" (*Craspedia*) stand up in protest to the twigs and nails in the wayfarer's garments, and the gums and "Apples" (*Angophora*) shower their scenty dews upon the road-sides; the stately "Ironbarks" and stunted "Boxes," the "Whitewoods" (*Atalaya*) and "Rosewoods" (*Heterodendron*), each contributes not a little to the changing hues of green; the "Buddha" and "Emu" bushes (*Eremophila*) are there and the Wattles, of which the "Sally," (*A. salicina*) rises erect in contempt to its stunted self "out back." and discounts its golden blooms there for its silvern here as a margin for its greater demands for supplies. The "Leopard Wood" tree, which unlike its namesake does change its spots, and the "Beef Wood" vainly offer their valued timber to industry; the "Wilga," because of its protection from the burning sun, has the distinction of being the tree best known to the sundowner; the "Quinine Bush" (*Alstonia constricta*), not an unworthy representative of its foreign and commercial vernacular, graces the banks of creeks in deep contrast to the glaucous xerophytes, and the "Oranges and Lemons" (*Capparis* and *Canthium*), wild though they be, closely associate as if in child-like sport. While as if to check the jubilation of it all, the moaning "Oaks" and weeping "Myalls" dirge the desolation of the recurrent condition of drought. Again, by way of the Warrumbungles the passes are camouflaged as inland coast country with types of sandstone flora; there the "Bullrushes" and "Flannel Flowers," the "Maiden Hairs" and ferns evidence that Nature has gone topsy-turvy with apparent contradictions. Much of the black-soil in which is a sprinkling of sandstone, which in wet weather makes this district notorious, has been washed down from the Warrumbungles and the basin of the traditional inland sea filled up to plain level with its crumbles.

Such is the general scope of life, animate and inanimate, on the Castlereagh, one of the most responsive areas in the State.

REVIEW.

We have received from the New South Wales Forestry Commission, Vol. 1, of "An Elementary Text Book of Australian Forest Botany," by C. T. White, F.L.S., Government Botanist of Queensland, and have to congratulate the author on the excellence of his work, as well as the Forestry Commissioners for supplying a standard work, which will not only prove of immense value to the rangers, but to the man on the land.

The book deals with morphology, anatomy and physiology, and should be in the hands of all botanical students, as it will be found extremely helpful for field work, and we hope that the author may be encouraged to further efforts, as the need for standard works on Australian botany, by Australian botanists is very pressing.—D.W.C.S.

OBITUARY.

Mr. E. S. Edwards, M.A.—It is with the deepest regret that we record the passing away of our friend and fellow member, Mr. E. S. Edwards. For many years past Mr. Edwards has been a valued and active member of council, where he has served as President, Vice-president, Hon. Secretary and member. He was a man of great intellectual attainments, and his delightful Presidential Address on August 5th, 1913 (Aust. Nat., Vol. III., 1914, p. 2) will be remembered as a treat of a very high order. The sympathy of the members goes out to Mrs. Edwards and to his son, Oliver, who, in his love of nature is following his worthy father's footsteps.

Ed. *A.N.*

Hilda Madeline Crispo.—Just as we go to press the sad news of the death on 26th September of Miss H. M. Crispo is announced. Miss Crispo was the youngest daughter of Mrs. M. Crispo, of Arncliffe, and a most useful and valued member of our Society, to which her passing away is indeed a severe loss. It was only at last annual meeting that Miss Crispo was elected a member of council, and the last issue of the *Naturalist* contains a charming illustrated paper by her on the larva of the goat moth, while quite recently we printed her report on the excursion to Balgowlah, and we have in hand the MSS. of her report on that to Lugarno Ferry. Miss Crispo was an expert photographer, and members are familiar with her exquisite photos. of Australian flowers. On behalf of the members we tender to her sorrowing mother and relatives our deepest heartfelt sympathy.

Ed. *A.N.*

NOTES AND COMMENTS.

Mr. W. B. Gurney.—The appointment of Mr. W. B. Gurney to the position of Government Entomologist in succession to Mr. Froggatt who retired recently, will be received with pleasure by his numerous friends in scientific circles in New South Wales, and particularly by the members of the Naturalists' Society.

Mr. Gurney has had the great advantage of a prolonged training under so able a chief as Mr. Froggatt, and the wide experience he has gained is of a kind to fit him for carrying out the important duties which now devolve upon him.

Ed. *A.N.*

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE PLANTS OF THE BIBLE.

By Thos. Steel.

"Consider the lilies of the field, how they grow:" Matt. VI.

The remarks which I submitted last session, on the Gem Stones of the Bible, were so well received by my fellow members that I have ventured to follow up another aspect of Bible Natural History study, to which I gave some attention in the course of my compilation of that essay; a study of the plants mentioned in the Bible.

As in the case of the gem stones, a little investigation shows that a great deal of uncertainty exists in the translation of the technical terms applied by the old Hebrew writers to plants. Not only are various names apparently used at different places for the same plant, but translators have frequently translated Hebrew into English names which are certainly erroneous, because these were plants unknown in Palestine and which subsequent botanical study has shown to be quite inappropriate.

Again being in many cases without any technical knowledge the translators have contented themselves with endeavouring to find an English equivalent of the Hebrew name.

One of the first scientific writers to apply a knowledge of the botany of Palestine to the elucidation of this interesting subject, was Canon Tristram, who, in speaking of the names used, shows that considerable numbers of different plants were grouped together under common titles, such as "thorns" for the characteristic xerophytic harsh, thorny plants growing in the dry parts of Palestine or in the deserts; or "bitter herbs" for the somewhat numerous Cruciferae or Compositae used by the eastern races as condiments.

Dr. J. H. Balfour, of Edinburgh, in 1886, or a year prior to Canon Tristram, published an excellent little work on the same subject. The Rev. John Duns also wrote a lengthy work in two volumes, published without a date, entitled "Biblical Natural

Science." In 1911 after very considerable advances had been made in our knowledge of the botany of Palestine, Egypt and the adjacent countries, Dr. A. B. Rendle, of the British Museum, issued a useful guide to the plants of the Bible. To all of these and other sources of information, I am indebted. I have endeavoured to select the conclusions, in doubtful or disputed cases, to which my own studies have led, and which appear to me most in accordance with what I judge to be the facts.

It is only when we approach the subject in this spirit, seeking to elicit what is true and to arrive at a correct interpretation of the allusions in Holy Writ, that we can hope to understand and appreciate the full beauty and the incidence of parable and record.

Progress in Biblical botanical research was long hindered by the fact that of the multitude of writers who visited the Holy Land few were qualified to deal with this aspect of the subject from a scientific standpoint.

We have the highest authority for the study of plants, for did not the Saviour himself say:—"Consider the lilies of the field, how they grow," and apart from that the allusions in the Bible to plants, both historical and sentimental, are numerous and important. We should remember that the imagery of the parables, was, as Duns says, borrowed from the scenes amidst which they were spoken, and so it is all the more necessary for their full understanding that we should have an accurate knowledge of these scenes. It has been estimated by Dr. Rendle that at least 120 different plants are mentioned in the Bible, and as he points out, at the date of issue of the Authorised Version, knowledge of botany was in a very crude state, while the devout, but botanically ignorant students who carried out the translation were in no sense qualified to deal with technical names.

In following up our subject, rather than attempt to adhere to a strictly botanical system of classification, I have arranged the plants in no definite order, but have taken trees and timbers first and followed on with herbs and smaller plants.

Box-wood. There are several allusions to this timber, which, it is fairly certain, refer to *Buxus latifolia,* the Box-tree of Palestine, a tree closely allied to *B. sempervirens,* of Europe. The timber is hard grained and durable. It is mentioned under the Hebrew term *teashur* in various parts of the Bible. Thus Ezek. 27 ch., 6, in the account of Tyrus and its trade, in describing the ships, uses the terms *ashur* which is considered an abbreviation of the former name. The term Ashurites should be translated ashur-wood or box-wood, and the whole passage should read:—"Of the oaks of Bashan have they made their oars; the benches of the rowers have they made of ashur-wood (box-wood), inlaid with ivory, brought out of the Isles of Chittim" (the isles of Greece). Isaiah 41 ch., 19, includes the box amongst the trees for renovating the wilderness, and (Isa. 60 ch., 13), for beautifying the sanctuary.

Gophir-wood. In Gen. 6 ch., 14, directions are given for this wood to be used for building the ark. This is probably the same as *copher*, the cypress pine (*Cupressus sempervirens*), which grows plentifully in Chaldea and Armenia and is in every way suitable for the purpose.

Almug-tree. Solomon used almug timber brought by Hiram along with gold from Ophir (India), for the pillars of the temple and for making musical instruments (I. Kings. 10 ch., 11-12). The wood, which was obviously very highly valued, has been identified with two Indian timbers, red sandal or sanders wood, either *Adenanthera pavonina* or *Pterocarpus santalinus* and with the common sandal-wood (*Santalum album*), any one of which would be suitable.

Ebony. The ebony (Hebrew *hobnim*), mentioned (Ezek. 27 ch., 15), as being brought by the men of Dedan—the people of the Persian Gulf—is the heart-wood of *Diospyros ebenum*, a native of India.

Cedar. No tree has received more prominent notice in the Bible than the cedar of Lebanon (*Cedrus libani*). "The boughs thereof were like goodly cedars" (Ps. 80 ch., 10). In biblical times the tree grew plentifully on Lebanon. It is a magnificent tree, evergreen, with wide-spreading branches. It yields a fine timber which was very largely used in building the temple at Jerusalem, the trees being sent by Hiram, King of Tyre, and used in making pillars, walls, floors and numerous fittings, also in the construction of the palaces of David and of Solomon. Allusions to the sources of supply and use of this timber are frequent in various chapters of 2 Sam., I. Kings., 1 Chron. and 2 Chron., while symbolical allusions to the beauty, strength and size of the tree and to its fragrant resin, are also numerous. Two translations as cedar (Lev. 14 ch., 4; and Numb. 19 ch., 6), are considered by authorities to be erroneous and to refer to a resinous juniper (*J. excelsa*) which was one of the plants used as incense and which would be much better adapted for the purpose described, in connection with the ceremonial sacrifice of burnt offerings.

The quantity of this valuable timber used in the construction of the temple and palaces must have been enormous, for we read (I. Kings. 10 ch., 27; 2 Chron. 9 ch., 27), that "Solomon made silver in Jerusalem as stones, and cedar trees made he as sycamore trees (Sycamore fig-trees) that are in the low plains, in abundance."

In describing the transient glory of Assyria, Ezekiel compares it to the cedar "with fair branches, and a shadowing shroud, and an high stature" (Ezek. 31 ch., 3). In Psa. 80, v., 10, we have a comparison of Israel to "the boughs of the goodly cedars" and in Song. Sol. 5 ch., 15, the church is likened to an "excellent cedar." For a proper understanding of this and other following references to the Song of Solomon, or as it is sometimes called, "The Canticles," it is necessary to remember that this book is really a prophecy, an allegorical parable descriptive of the future Church of Christ, the "Bride of the Lamb" of Rev. 21 ch., 9, "Come hither, I will show thee the bride, the Lamb's wife, ... and he showed me that great city, the holy Jerusalem, descending out of heaven from God." A knowledge of this fact renders clear and incisive the various references in the beautiful imagery of the Song, which is cast in the anthropomorphic language customary at that period and which was borrowed from the Egyptians. In this book and also in the Psalms and in the didactic and prophetic books, Job, Proverbs, Ecclesiastics. etc., the influence of Egyptian symbolism can be clearly traced. Thus for example in Psa. 104, v., 24:—

"O Lord, how manifold are thy works!
In wisdom hast thou made them all:"

In the "Hymn to Aton," written probably 2,000 years B.C., we have:—

"How manifold are thy works!
They are hidden from us."

Again in the "Dialogue of a Misanthrope," written some 1,500 years before the Book of Job, we have the description of an exact counterpart of Job, "a man once prosperous brought to ruin, deserted by friends and relatives, and stricken with disease," debating in his mind whether it would be better to die than to live.*

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*Dr. Mace, in Annals of Archaelogy and Anthropology. Vol. ix., 1922.

As was the case during the captivity in Babylon, so in that in Egypt, a profound impression was made on the mode of expression and thought of the Israelites, both in their poetry and their prose. Even their language became more or less corrupted by their environment. The setting up of the golden calf in the wilderness, was a direct result of the influence of Egyptian bovine worship.

The firm rooting of the great tree and its fragrance are spoken of by Hosea (Hos. 14 ch., 5-6), and in the Song. Sol. 4 ch., 11, "Cast forth his roots as Lebanon" and "his branches shall spread and his smell as Lebanon."

In relating the wisdom of Solomon (1 Kings. 4 ch., 33), it is stated that "he spake of trees; from the cedar that is in Lebanon even unto the hyssop (caper-bush) that springeth out of the wall."

In the magnificent imagery of Isaiah the cedar finds a place (Isa. 2 ch., 13), "the cedars of Lebanon that are high and lifted up," and in 37 ch., 24, the "tall cedars" are referred to. In Ps. 92, v., 12, the righteous "shall grow like a cedar in Lebanon" and in Numb. 24 ch., 6, Israel is compared to "cedar trees beside the waters." Symbolic and other references to the same tree occur in many other places.

Thyine-wood. Amongst the merchandise of Babylon mentioned in Rev. 18 ch., 12, is thyine-wood, the timber of *Callitris quadrivalvis,* a small tree native of Africa. The wood is close-grained and heavy, and was used for inlaid and ornamental work. It was dark brown in colour, and had a fragrant perfume.

Almond-tree. (*Amygdalus communis*). A native of Palestine, this valued tree is frequently mentioned. The Hebrew name *Shaqed,* meaning "to hasten" has reference to the fact of the blossoms opening before the leaves. The vision of Jeremiah (Jer. 1 ch., 11-12), introduces a rod of this tree as a symbol. "What seest thou? And I said, I see a rod of an almond tree. Then said the Lord unto me, Thou hast well seen: for I will hasten my word to perform it." Also (Numb. 17 ch., 8), Aaron's rod budded and produced almonds.

The Hebrew word *luz* in Gen. 30 ch., 37, used in the account of the preparation of the rods by Jacob, which, in the Authorised Version is translated "hazel" is thought by students to be really almond, the wild variety being designated.

Amongst the articles which Jacob sent by his sons to Joseph in Egypt (Gen. 43 ch., 11), were almonds, from which it is inferred that the tree did not grow in Egypt, and that it continued to fruit in Canaan, in spite of the famine. As a symbol of the quick approach of death, from its connection with the idea of "hastening" already referred to, the almond is introduced in Eccl. 12 ch., 5, in the description of the coming of adversity.

In the ornamental work of the tabernacle (Exod. 25 ch., 33-34; 37 ch., 19-20), the golden bowls of the candlesticks are modelled on almonds.

Apple—Citron—Apricot. There has been a good deal of difference of opinion regarding the meaning of the Hebrew word *"tappuah"* occurring in several places (Song. Sol. 2 ch., 5; 7 ch., 8; 8 ch., 5; and in Prov. 25 ch., 11) the latter being—"A word fitly spoken is like apples of gold in pictures of silver." In all of these texts it is rendered "apple" or "apple tree" in both Auth. and Revd. Versions. From the nature of the references it is plain that a flourishing tree with grateful golden fruit is meant, and as the apple does not thrive in Palestine, some other fruit is indicated. Canon Tristram suggests the apricot (*Armeniaca vulgaris*) which grows freely in Palestine, but later commentators challenge this conclusion and suggest the citron, while one suggestion is the quince.

Theophrastus describes the citron as growing in Media three centuries before Christ.

In Lev. 23 ch., 40, the Hebrew *etz hador* is rendered "boughs of goodly trees" and it has been suggested that this should be "boughs of citron trees." Josephus in his "Antiquities of the Jews," tells us that "the law of the Jews required that at the feast of tabernacles every one should have branches of palm tree and citron tree," and I understand that this is still a rule in the faith of that ancient race.

Whether the other references cited should be considered as citron or as apricot, is perhaps open to doubt. The preponderance of evidence seems to favour the citron, seeing that it had a historical and ritual standing with the Jews, prior to the writing of the books mentioned, and so was quite likely to be used in allegory.

Bay. The well known passage (Psa. 37, v., 35), "I have seen the wicked in great power, and spreading himself like a green bay tree," may refer to the sweet bay (*Laurus nobilis*), a native of Palestine, but Dr. Rendle suggests that as the same word *"ezrah"* is elsewhere translated "native," as opposed to a stranger, the reference may be to any tree flourishing in its native soil.

Plane-tree. At two places in the Old Testament (Gen. 30 ch., 37; Ezek. 31 ch., 8), the Hebrew *armon* is in the Auth. Vers. translated chestnut tree. The chestnut however is not native to Palestine, and the Revised Vers. make it plane-tree (*Platanus orientalis*). In the first reference a rod of this tree is amongst those used by Jacob, and in the second it is amongst the trees mentioned in a symbolical sense.

Fig-tree. (*Ficus caricus*). This important food fruit is frequently introduced in both old and new testaments. The earliest reference is to the use of the leaves by Adam and Eve for clothing (Gen. 3 ch., 7). The promised land was described as "a land of wheat and barley, and vines and fig-trees" (Deut. 8 ch., 8). And again (Micah. 4 ch., 4; Isa. 36 ch., 16; Zech. 3 ch., 10), in prophesying the establishment of Christ's Kingdom, sufficiently indicate the importance attached to this useful tree. Likewise 1 Kings. 4 ch., 25, "And Judah and Israel dwelt safely, every man under his vine and under his fig-tree." Again it was under a fig-tree Jesus saw Nathaniel (John. 1 ch., 48, 50).

The fruit was pressed and dried for preservation as food, as is evidenced by 1 Sam. 25 ch., 18, where Abigail took amongst other provisions for the journey to meet King David, "two hundred cakes of figs," and 1 Sam. 30 ch., 12, where David gave the starving Egyptian "piece of a cake of figs."

The great store naturally set on so valuable a tree is further evidenced by the fact that to have it barren or destroyed was considered in the nature of a national calamity. Thus Joel 1 ch., 6, 7, describing judgment against the people for wrong doing, speaks of the "barked fig-tree," and Habakkuk 3 ch., 17, on the same theme, says "the fig-tree shall not blossom."

The most esteemed figs were those which ripened about the time of the Passover, early in summer, when the winter was past. This is well brought out in Hos. 9 ch., 10, "the first-ripe in the fig-tree at her first time," and in Song. Sol. 2 ch., 13, "The fig-tree putteth forth her green figs," while the appearance of the fresh green leaves is a token of the coming summer (Matt. 24 ch., 32). The incident of the barren fig-tree related in Mark. 11 ch., 13, and Matt. 21 ch., 19, is made clear when we consider the following points. In Palestine the fig-tree puts forth its first and most delicate fruit about the time of the Passover, in late June or early July, *before* its leaves. And as it was at the time of the incident, in full leaf, although "the time of figs was not yet," that is the fig harvest when the main crops was gathered, the fact that there was no fruit when it should have carried the early crop, and it being too early for it to have been stripped, shows that the tree was barren and merely a bearer of leaves, an incumbrance only fit for being rooted out (Luke 13 ch., 6-7). In this it was a type of "the boastful pharisaism" which was so obnoxious to our Lord and "so He made it present the further type of the hypocrites' doom, the Pharisee's judgment and Jerusalem's desolation." Isaiah (Isa. 28 ch., 4) refers to this early fig crop thus, "And the glorious beauty, shall be a fading flower, and as the hasty fruit before the summer; which, when he that looketh upon it seeth, while it is yet in his hand he eateth it up."

The use of the fruit as a plaister for the boil from which Hezekiah was suffering, is related in Isa. 38 ch., 21, while in the same book (34 ch., 4), the falling fig is one of the signs of judgment, as also in Rev. 6 ch., 13; Hos. 9 ch., 10; Nahum 3 ch., 12.

In Jer. 24 ch., 2, *et seq.*, and 29 ch., 17, powerful illustration of the prophesy of renovation of Israel is brought out by comparison of good and bad figs. The parable of the figs and thistles (Matt. 7 ch., 16), and the remarks in James 3 ch., 12, in a similar strain, point an impressive moral. Finally in Judges 9 ch., 10, the fig-tree in the parable is amongst those which decline to be made ruler of the trees.

Fir-tree. There is some difference of opinion amongst commentators as to the identity of the tree which in Hebrew is termed *berosh* or *beroth*. Earlier authorities translated these as cypress (*Cupressus sempervirens*) which is not a native of Palestine, but more recent students consider that it is really the Aleppo pine (*Pinus halepensis*) which belongs to Palestine and grows freely on Lebanon along with the cedar. The tree is constantly associated with the cypress because of its being like the latter, a fine tree. It was largely supplied to Solomon by Hiram for use in building the temple, the floors, ceilings and doors being made of its timber. Speaking of the glory of Assyria, Ezekiel (31 ch., 8), says "The cedars in the garden of God could not hide him, the fir-trees were not like his boughs." In a blasphemous message sent to Hezekiah, Sennacherib boasts:—"With the multitude of my chariots I am come up to the height of the mountains, to the sides of Lebanon, and will cut down the tall cedar-trees thereof, and the choice fir-trees thereof" (2 Kings. 19 ch., 23; Isa. 37 ch., 24).

Musical instruments on which David and all the house of Israel played, were constructed of fir. The timber was also used for the rafters of houses (Song Sol. 1 ch., 17). In connection with the renovation of the earth foretold by Isaiah (Isa. 41 ch., 19), "I will set in the desert the fir-tree" and (Isa. 55 ch., 13), "Instead of the thorn shall come up the fir-tree"; and again (Isa. 60 ch., 13), "The glory of Lebanon shall come unto thee, the fir-tree, the pine-tree and the box together, to beautify the place of my sanctuary."

Juniper. The plant commonly referred to in the Bible under this name, is really not a juniper, but a species of broom (*Roetama roetam*). The Hebrew name *rothem,* so translated, is the same as the Arabic *retem.* It is a common desert plant growing to a height of 10 or 12 feet, and is mentioned in 1 Kings, 19 ch., 4, 5, as the tree under which Elijah took shelter from the mob when pursued by Jezebel. The Arabs made charcoal of the roots, hence the allusion in Ps. 120, v., 4, where David calls for "sharp arrows of the mighty, with coals of juniper" as a punishment for his detractors. The use of the roots as food by the Edomites in the time of their extremity is mentioned (Job 30 ch., 4).

Locust-tree. In the parable of the prodigal son (Luke, 15 ch., 16), "the husks which the swine did eat" were the sweet pods of the carob or locust tree (*Ceratonia siliqua*), which is abundant in Palestine, the pods are still used for feeding stock. The generic name is derived from the Greek *Keratia* the term applied to the pods from their fancied resemblance to *Keras* a horn. Some commentators consider that these pods were the "locusts" which with wild honey formed the food of John the Baptist when in the wilderness (Matt. 3 ch., 4), but this is now considered erroneous. From this mistaken idea arose the name "S. John's bread," the "Johannisbrod" of the Germans, applied to the pods. Various species of the predatory locusts were cooked and used for food and they were amongst the creatures specially sanctioned by Moses (Lev. 11 ch., 22). "Ye may eat of . . . the locust after his kind, and the bald locust after his kind." The insects are eaten over a wide range in Africa and the East. In taste they are stated to resemble red herrings and are esteemed a delicacy.

Mulberry-tree. In 2 Sam. 5 ch., 23-24, the Hebrew word *bekaim* has been rendered mulberry in the Auth. Vers. This refers in all probability to a trembling poplar (*Populus euphratica*) and explains verse 24 "when thou hearest the sound of going in the tops of the mulberry trees," which clearly refers to the rustling in the wind of the foliage of the poplar.

Black mulberry. (*Morus nigra*) is in the New Testament called the sycamine tree. It is mentioned in the parable, Luke

17 ch., 6. This is the Greek *sukaminos* and is largely grown for feeding silkworms, as well as for its fruit.

Myrtle. This tree (*Myrtus communis*), Hebrew *hadas,* is a common plant in Palestine. It is mentioned (Neh. 8 ch., 15) as one of the plants gathered on the Mount of Olives to decorate the city during the rejoicings celebrating the return from captivity in Babylon, but it has now become extinct in that locality. In Isa. 55 ch., 13 and 41 ch., 19, the prophet says:—"Instead of the brier shall come up the myrtle-tree," and "I will plant in the wilderness the cedar . . . . and the myrtle." It was a favourite plant, and the female name Hadassah, which is translated Esther, is derived from the name.

Oak. There are five Hebrew terms derived from one root which refer to the oak, the names appear to be interchangable and do not differentiate between the several native species which are now recognised. The Valonian oak (*Quercus aegilops*) is a deciduous tree, the fruit of which is edible. It grows freely, both in Palestine and across the Jordan in Bashan. It is referred to by the prophets Isaiah and Zechariah, in foretelling the fall of Jerusalem (Isa. 2 ch., 13), "The day of the Lord shall be upon all the oaks of Bashan," and Zech. 11 ch., 2, "Howl, O ye oaks of Bashan; for the forest of the vintage is come down." The timber of this species was used for oars in Tyre during its days of prosperity; "Of the oaks of Bashan have they made thine oars" (Ezek. 27 ch., 6). Another deciduous species (*Q. insectifera*) occurs also in the Holy Land. *Q. pseudococcifera* the evergreen oak is the commonest species in Palestine. This is the species which for centuries has marked the site of Mamre (Gen. 18 ch., 1), where Abraham entertained the angel visitors. The oak took the place of the terebinth which originally grew on the spot.

The oak was clearly looked upon as an important tree. When Joshua announced to the people the law of God (Josh. 24 ch., 26), "he took a great stone and stood it up there under an oak." Deborah, Rebekah's nurse when she died (Gen. 35 ch., 8), was buried under an oak in Bethel, and the name of it was called *allon-bachuth* (the oak of weeping). Amos. 2 ch., 9, refers to the strength of the oak, in describing the destruction of the Amorite.

In quite a number of places the word translated "plain," should be rendered "oak" or "oak-grove." Thus in 1 Sam. 10 ch., 3, "the plain of Tabor" should read "the oak groves of Tabor," in Judg. 9 ch., 37, in place of "plain of Meonenim" it should be "the oak of the magicians." Other similar references may be given, Gen. 12 ch., 6; 13 ch., 18; 14 ch., 13; 18 ch., 1; Deut. 11 ch., 30; Judg. 4 ch., 11; 9 ch. 6.

Olive. (*Olea europea*). One of the most prominent features of the Promised Land in the various prophecies regarding it, is the olive. "A land of vine-yards and olive trees" (Deut. 6 ch., 11); "A land of oil olive and honey" (Deut. 8 ch., 8); "A land of vineyards and olive yards" (Josh. 24 ch., 13). In the first recorded parable in the Bible (Judg. 9 ch., 8), the olive was the tree to which the first offer of rulership over the other trees was made.

In the Holy Land there were two sorts of olives, the wild and the cultivated. The former grew from seedlings or suckers and produced small worthless fruit, whilst the latter was grafted and produced good fruit. This explains the reference in Rom. 11 ch., 16 to 25, "For if thou wert cut out of the olive tree, which is wild by nature, and wert graffed contrary to nature into a good olive tree: how much more shall these, which be the natural branches, be graffed into their own olive tree."

The olive grows best, not on the mountains, but on the low plains, and hence its leaf brought by the dove to Noah, showed that the flood had abated from the lands which were capable of cultivation. On account of this the olive branch became the emblem of peace and as such it has been held in veneration by all races for ages. The Greek word *eliaos,* mercy, is derived from *elaia,* an olive. The tree blossoms in June, producing great clusters of white fragrant flowers, which fall in large numbers, carpeting the ground with white, hence the reference (Job. 15 ch., 33). "He shall shake off his unripe grape as the vine, and shall cast off his flower as the olive." The Prophets used it as a type of beauty and luxuriance. "His beauty shall be as the olive tree" (Hos. 14 ch., 6), and "The Lord called thy name. A green olive tree, fair, and of goodly fruit" (Jer. 11 ch., 16).

It was customary to knock off the fruit with long sticks, but the Israelites were forbidden to go over the trees a second time, what remained being left for the gleaners (Deut. 24 ch., 20), "When thou beatest thine olive-tree, thou shalt not go over the boughs again: it shall be for the stranger, for the fatherless, and for the widow."

The timber of the olive was formerly supposed to have been used in constructing the Cherubim covering the ark of the tabernacle (1 Kings. 6 ch., 23), "And within the oracle he made two cherubim of olive-tree, each ten cubits high." Hence the question and answer in Zech. 4 ch., 11-14, and the reference in Psa. 52., v., 8, "I am like a green olive-tree in the house of God," and that in Rev. 11 ch., 4, "These are the two olive-trees and the two candlesticks, standing before the God of the earth." In all of these quotations, however, olive is a mistranslation. In Isa. 41 ch., 19, the Hebrew *ec shemen* is correctly translated "oil tree":—"I will plant in the wilderness the cedar, the shittah tree, and the myrtle, and the oil-tree." This in all probability refers to the oleaster (*Eleagnus angustifolia*) a small tree abundant in Palestine, which bears a bitter berry yielding an inferior oil. The timber is hard and closegrained and well suited for carving.

Palm. The palm of the Bible is the ordinary date-palm (*Phoenix dactilifera*). The generic name phoenix refers to the springing up of several young trees from the roots of old ones which have been destroyed. Different parts of this tree were put to most varied uses. The great spreading leaves yielded thatch for the houses, while couches, baskets, bags and numerous other articles were made from them. From the fibre of the leaf-stalks rope and twine were spun. According to Gibbon, the natives of Palestine record over 360 uses to which different parts of this tree were put. The palm wine prepared from the sap is supposed to be the "strong drink" denounced in Isa. 5 ch., 11; and 24 ch., 9, as this, being made from more concentrated juice, would be much more potent than that made from grape juice in the then customary manner.

The holy place or sanctuary of the temple was looked upon as representing the actual presence of God, and this was symbolised by palm trees engraved on the walls and doors, between Cherubim. The palm-tree from its longevity and productiveness and the fancied resemblance of the great crown of leaves to the sun's rays, had come to be considered as a symbol of the Divine presence, the forerunner of the body of Christ, just as the sacred banyan tree (*Ficus religiosa*) is revered by the Hindus "because of its long endurance, its outstretched arms, and its overshadowing beneficence, is regarded as a symbol of the Deity." In 1 Kings, 6 ch., 29, 32, 35, in the account of the fittings of the sanctuary, we read "he carved thereon cherubim and palm-trees and open flowers," and again in Ezek. 41 ch., 18-20, 25, 26, "and it was made with cherubim and palm trees, so that a palm tree was between a cherub and a cherub."

Pomegranate. (*Punica granatum*). The promised land was described (Deut. 8 ch., 8; Numb. 13 ch., 23), as "a land of vines and fig-trees and pomegranates." The Israelites when sojourning in the wilderness complained that Moses had brought them out of Egypt, "a place of figs, vines and pomegranates." Several towns in Palestine were named in Hebrew *rimmon* after the plant. For the capitals of the pillars of the Temple the fruit and flowers supplied models and also for the embroidered decoration of the High Priests robes (Exod. 28 ch., 33-34), "and beneath upon the hem of it, thou shalt make pomegranates of blue, and of purple, and of scarlet." The ornamental net work covering the pillars Jachin and Boaz, had 400 figures of pomegranates worked into the pattern 1 Kings 7 ch., 18, 42; 2 Kings. 25 ch., 17).

Wine was made from the fruit (Song. Sol. 8 ch., 2). Symbolical allusions to the tree occur also in Song. Sol. 6 ch., 11, and 7 ch., 12.

Sycamore. (*Ficus sycomorus*). Hebrew *shikmim,* Greek *sukomorea,* the Greek name being derived from *sukon* fig, and *moron* mulberry. Amos (7 ch., 14), described himself to Amaziah as "a gatherer of sycamore fruit." Literally translated this means "one who scraped or cut" sycamore fruit. The significance of this lies in the fact that this was a poor fruit compared with the fig and to render it edible it was necessary to scrape or cut off the top of the fruit when nearly ripe in order to permit the acrid juice to escape. The tree was small and easily climbed and we read (Luke 19 ch., 4), that Zaccheus ran and climbed into one when Christ was approaching. We have already seen (1 Kings. 10 ch., 27: 2 Chron. 1 ch., 15; 9, 27), how Solomon made cedar to be as abundant as sycamores. The timber was light but durable, and was the principal timber used by the Egyptians in the construction of mummy cases.

Shittah-tree. (*Acacia seyal*). There is only one reference to the tree (Isa. 41 ch., 19), but shittim wood is frequently mentioned in accounts of the making of the Tabernacle in the wilderness (Exod. 25 ch., to 30). It grew abundantly in hot dry situations, several of which are named after it, Joel 3 ch., 18, "a fountain shall water the valley of Shittim." "And Israel abode in Shittim" (Numb. 25 ch., 1), this being the last camping place before they crossed the Jordan into the promised land, and, by the way, in which they behaved so badly.

Terebinth or *Teil-tree.* (*Pistacia terebinthus*). There are several references under the Hebrew name *elah,* signifying a strong, robust tree, which have been variously rendered. Thus in Isa. 6 ch., 13, the word is translated "Teil-tree"; in Gen. 35

ch., 4; Judg. 6 ch., 11, and elsewhere as "oak" or "elm," but the Septuagint correctly makes it "Terebinth" and this name is also given as a side note in the Revised Version. In appearance the tree resembles the oak, it yields turpentine resin when tapped and is common in Palestine.

Willow. (*Salix Babylonica*). Several species of *Salix* grow in Palestine, including the Weeping Willow, and the most notable reference to the tree is in Psa. 137, v., 1, 2, "By the rivers of Babylon there we sat down; yea we wept, when we remembered Zion. We hanged our harps upon the willows in the midst thereof."

It has been suggested by Canon Tristram that the "willows" of the watercourses in Lev. 23 ch., 40, "And ye shall take on the first day the boughs of goodly trees . . . . and the willows of the brook" and in Isa. 44 ch., 4, "And they shall spring up among the grass, as willows by the water-courses" should be rendered "Oleander" (*Nerium oleander*), as this plant is very characteristic of such situations on the upper Jordan, fringing the stream with a dense growth of green, or, in the flowering season, of red.

Walnut. (*Juglans regia*). This tree though not a native of Palestine, has always been largely grown there and it was cultivated in the garden of Solomon. In Song. Sol. 6 ch., 11, it is mentioned, "I went down into the garden of nuts to see the fruits of the valley." In Gen. 43 ch., 11, the nuts sent by Jacob with other articles to Joseph in Egypt, were not the walnut but the fruit of *Pistacia vera,* the pistachio nut, termed *"botnim"* in Hebrew. These were largely grown in Palestine, and with "balm, honey, spices, myrrh and almonds" would be quite appropriate. The English name "walnut" or "walled-nut," refers to the division of the kernel into four sections by the double wall or membrane in the centre.

Vine. The first mention of the vine in Scripture is in Gen. 9 ch., 20, when "Noah planted a vineyard." For its fruit, drying as raisins, making wine and so on, the vine was of first importance and frequent mention of it is made in narrative and parable. The Chief Butler's dream, (Gen. 40 ch., 9-11), which was interpreted by Joseph, shows that the vine was cultivated in Egypt, and the plant is commonly represented on both Assyrian and Egyptian monuments.

Raisins were a common article of food and "an hundred clusters of raisins" were taken with the "two hundred cakes of figs" before mentioned, by Abigail (1 Sam. 25 ch., 18); raisins

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were also given by David to the starving Egyptian (1 Sam. 30 ch., 12), and were amongst the provisions for the feast marking the elevation of David as King of Israel (1 Chron. 12 ch., 40). The thin wine used as a common beverage by the poorer classes is frequently translated "vinegar," as in Ruth. 2 ch., 14, when Boaz entertained Ruth.

The "vinegar" offered to Christ on the cross was not what we know as vinegar, it was a thin wine somewhat like the *vin ordinaire* of the French. In Matt. 27 ch., 34, we read:—"Then they gave him vinegar to drink mingled with gall: and when he had tasted thereof, he would not drink"; while Mark. 15 ch., 23, says:—"And they gave him to drink wine mingled with myrrh: but he received it not." This was the first drink offered. The word here translated "gall" means something bitter and refers to wormwood, see Jer. 8 ch., 14 and Ps. 69, v., 21. The mixture of wine with myrrh and wormwood was commonly given to crucified persons in order to stupefy them and shorten their sufferings. It will be noticed that the Saviour refused to take this mixture, he would not do anything to hasten his death. But later on, as related in Matt. 27 ch., 48, and John 19 ch., 29, he readily took the plain wine when offered to him. This I think was really an act of kindness by the rough soldiers, who when the Saviour said "I thirst" (John 19 ch., 28), hastened to give him of the wine provided for their own refreshment.

The illustrations by the Prophet Jeremiah (Jer. 25 ch., 30), "he shall give a shout as they that tread the grapes" and in Gen. 49 ch, 11; Isa. 63 ch., 2-3, the reference to the staining of the clothes of the treaders with the blood of the grape, refer to the method of expressing the juice, wherein the pressers leaped amongst the grapes, shouting to encourage one another in the hard work. Their legs and clothing became stained with the red juice.

Wild Gourd. The wild gourd mentioned in 2 Kings 4 ch., 38-40, which was inadvertently ("for they knew them not") shredded into the pottage prepared by Elisha's orders, is considered to be the fruit of the colocynth (*Citrellus colocinthis*). The fruit though attractive in appearance is exceedingly nauseous and drastic in its effects, hence the exclamation of the people when they tasted the pottage:—"O thou man of God, there is death in the pot." The Vine of Sodom referred to in Deut. 32 ch., 32, is suggested by Canon Tristram to be the same plant.

Wheat. There are many allusions to wheat, historical and symbolical. The wheat of Palestine is spelt (*Triticum spelta*) and the separated grain is usually referred to as corn. This very important food plant, grown from time immemorial as a cultivated crop, is not known in its wild state. Wheat was one of the attractions of the Promised Land, (Deut. 8 ch., 8), "A land of wheat and barley." The seven eared wheat of Pharaoh's dream (Gen. 41 ch., 5), is a variety (*T. compositum*) of robust habit, with a semi-solid stalk, still cultivated in Egypt, where it is commonly known as "mummy wheat." The righteous are in several of the parables likened to wheat, while the operation of threshing with flails or by the treading of oxen are spoken of, as in Deut. 25 ch., 4, "Thou shalt not muzzle the ox when he treadeth out the corn." Corn when roasted in its green state is several times mentioned as "parched corn" and was eaten without further preparation.

The well known quotation:—"Cast thy bread upon the waters: for thou shalt find it after many days." (Eccl. 11 ch., 1) refers to the custom of scattering the seed grain on the surface of the irrigation water with which the fields were covered. This ensured quick germination. This is the ordinary way of sowing rice, which, however, is a grain not mentioned in the Bible.

When Balaam was taken by Balak to the top of Peor, he was referring to the same custom when amongst other words of blessing on the Israelites he said:—"He shall pour the water out of his buckets, and his seed shall be in many waters." (Numb. 24 ch., 7).

Barley. This crop was also of universal cultivation in Palestine. The barley harvest was earlier than that of wheat, and this is why in the Egyptian plague of hail, the flax and the barley perished while the wheat escaped (Exod. 9 ch., 31) "and the flax and the barley was smitten: for the barley was in the ear, and the flax was bolled, but the wheat and the rye were not smitten for they were not grown up."

Millet. Two different plants were known in Hebrew as *dohan* and translated "millet." These were *Panicum miliaceum* and *Sorghum vulgare.* In Ezek. 4 ch., 9, directions are given to include this grain amongst the ingredients for making bread.

Tares. This troublesome weed, referred to in the parable of the tares and wheat (Matt. 13 ch., 24), is the common darnel (*Lolium temulentum*); in verse 38 tares are likened to "the children of the wicked one."

Lentils. The seeds of a species of vetch largely grown in Palestine. The best known reference is of course that in Gen.

25 ch., 29, where Esau sold his birthright. When David fled from Absalom (2 Sam. 17 ch., 28), he took for provisions "wheat and barley, and flour, and parched corn, and beans, and lentils, and parched pulse." Then as related in Ezek. 4 ch., 9, lentils were an ingredient in making bread.

Reed. When Jesus spoke of John and asked (Matt. 11 ch., 7), "What went ye out to see, a reed shaken in the wind," he was referring to *Arundo donax,* the reed of Egypt and Palestine, and the same plant was put in the Saviour's hand (Matt. 27 ch., 29-30).

Bulrush—Rush. This is the Egyptian Papyrus (*Cyperus papyrus*), (Exod. 2 ch., 3; Isa. 35 ch., 7). Again in Job 8 ch., 11, "Can the rush grow up without mire? can the flag grow without water?" we have an accurate account of the natural habit of the plant.

Flax. (*Linum sativum*). This very important fibre plant was largely grown in Egypt and Palestine for making linen. The stalks being dried in the sun on the house top were used to conceal Joshua's spies when at Jericho (Josh. 2 ch., 6). "The smoking flax shall he not quench" (Isa. 42 ch., 3 and Matt. 12 ch., 20), refer to the use of flax fibre for lamp wick. Linen was used very extensively in Egypt for wrapping mummies and in Palestine we have particular mention of it in making the garments of the Chief Priest.

That flax was well known in Samson's time is evidenced by the reference (Judg. 15 ch., 14) when the men of Judah bound him with new cords, which "became as flax that is burnt with fire" so that he broke them easily. In the description of the virtuous woman (Prov. 31 ch., 13, 24), "She seeketh wool and flax, and worketh willingly with her hands." . . . . "She maketh fine linen and selleth it; and delivereth girdles unto the merchant."

In prophesying the confusion of Egypt, Isaiah 19 ch., 9, says "Moreover they that work in fine flax, and they that weave networks" (or white works), "shall be confounded." There are numerous references to linen in clothing and other articles, in Exod., Levit., Deut., and Chron. Samuel "ministered before the Lord, being a child, girded with a linen ephod" (1 Sam. 2 ch., 18). The ephod was a short cloak divided into two parts joined at the shoulders. When the ark was brought into the city, David "girded with a linen ephod" danced before it and thereby earned the contempt of Michal, Saul's daughter, who watched him through a window. Solomon imported linen yarn from

Egypt (1 Kings. 10 ch., 28). The "rich man was clothed in purple and fine linen" (Luke 16 ch., 19), as was also Mordecai when he left the presence of King Ahasuerus (Est. 8 ch., 15). Numerous other references may be passed over, until we read (Matt. 27 ch., 59 and Mark 15 ch., 46) how Joseph of Arimathea "bought fine linen" in which he wrapped the body of Jesus. In Luke 16 ch., 19 and Rev. 18 ch., 12, 16, the Greek word *byssus* is translated "fine linen" and from this is derived the term "byssus" applied to the fibrous anchoring filaments of molluscs like the mussel.

Hyssop. Several different plants have been suggested for hyssop, the plant used for sprinkling the door posts with the blood of the pascal lamb (Exod. 12 ch., 22), and for a sprinkle in curing lepers (Lev., 14 ch.), and the ceremony of purification described in Numb. 19 ch. Of these the most probable appears to be the caper (*Capparis spinosa*) a creeping plant common in the desert country of Sinai. The words of Psa. 51 v., 7, "Purge me with hyssop, and I shall be clean;" are considered to refer to the use of the flower buds, which constitute the capers of commerce and to which cleansing properties are attributed.

Rose. The term "rose" is used in a symbolical manner, as in, "The desert shall rejoice and blossom like the rose" (Isa. 35 ch., 1), "I am the rose of Sharon" (Song. Sol. 2 ch., 1).

The reference is probably to any sweet flower but may be the sweet scented narcissus (*N. tazetta*) a native of Palestine. This is rendered probable from the fact of the Hebrew word used *"habaceleth,"* indicating a bulbous plant.

Lily. The word lily occurs in several passages in the Old Testament being so translated from the Hebrew *"shosan."* Thus in Song. Sol. 2 ch., 1, "the lily of the valleys," while in the parable (Matt. 6 ch., 28) "consider the lilies of the field" the Greek "Krina" is so rendered. These probably refer to the beautiful *Anemone coronaria,* which is abundant in Palestine, particularly about the shores of Galilee. The Greeks called it "the crown imperial" or "royal lily." In his beautiful hymn for children Bishop Heber refers to both lily and rose thus:—

> "By cool Siloam's shady rill,
> How sweet the lily grows!
> How sweet the breath, beneath the hill,
> Of Sharon's dewy rose!"

Cucumber—Melon. The common garden cucumber (*Cucumis sativus*) was an important article of food in Palestine. In Isa. 1 ch., 8, "a lodge in a garden of cucumbers," refers to the rude shelter erected for the guards who protected the crops from wild animals such as jackals. The melons (*Cucumis melo*) and (*Citrullus vulgaris*) were also both grown on an extensive scale, both in Egypt and Palestine. In Numb. 11 ch., 5, it is related how the Israelites while in the wilderness mourned after "the cucumbers, and the melons, and the leeks, and the onions, and the garlick": which had been so abundant in Egypt.

Gourd. There is only one reference (Jonah 4 ch., 6-10) to the gourd, other than the wild gourd already mentioned, and though other plants, such as the castor-oil tree, have been suggested, the only one which answers the description is *Cucurbita pepo* a rapidly growing climbing gourd which withers rapidly when the stem is cut.

Mandrake. (*Mandragora officinarum*). This plant has been the subject of many superstitions. The roots were supposed, for example, to bear a human shape and to shriek when pulled. It is twice mentioned, in Gen. 30 ch., 14, and in Song. Sol. 7 ch., 13, "The mandrakes give a smell, and at our gates are all manner of pleasant fruits." The fruit is sweet and of good flavour, something like a large plum, and has a pleasant smell.

Onion, Leek, Garlick. These common pot herbs have been already mentioned when speaking of the cucumber.

Mint, Anise, Cummin, Rue. These were the herbs referred to by Jesus in his denunciation of the hypocritical Pharisees (Matt. 23 ch., 23; Luke II ch., 42), "Woe unto you, Pharisees! for ye tithe mint and rue, and all manner of herbs, and pass over judgment and the law of God." The tithe was a sort of tax amounting to one-tenth of the article taxed. The law did not require a tithe of these herbs and the denunciation was of the sham punctiliousness of those who voluntarily paid on small things of no particular value such as "cummin and rue," but neglected the important duties of humanity, as in the case of the Pharisees in Luke 18 ch., 12.

Fitches. A small annual, *Nigella sativa,* grown for the sake of its seeds which were ground and used as a flavouring agent or condiment, as in making bread (Ezek. 4 ch., 9). Isa. 28 ch., 27, "the fitches are beaten out with a staff," refers to the method of separating the seed. The prophet's references to the different methods of preparing the various grains, by beating, threshing and bruising, are a symbolical allusion to the various modes in which God corrects his people.

Manna. A lichen (*Leconora esculenta*) which at times is extremely abundant in the desert regions of Sinai and is blown into heaps by the wind.* It is generally considered to be the manna of the Israelites (Exod. 16 ch., 14, *et seq.*) and is used in parable by Jesus, (John 6 ch., 31). "Our fathers did eat manna in the desert; as it is written, He gave them bread from heaven to eat."

A critical study of the narrative in Exodus, 16 ch., and Numb. 11 ch., raises the question of whether there were not two sorts of manna. The tree manna, a sugary secretion exuding from insect punctures on the tamarisk tree (*Fraxinus*), and which under the name "Manna" is included in our Pharmacopoeia; and the lichen abovementioned. We read (Exo. 16 ch., 21) that "when the sun waxed hot, it melted," and in verse 31 "the taste of it was like wafers made with honey." Both these descriptions tally with the tamarisk secretion, while the account in Numb. 11 ch., 8, where "the people ground it in mills, or beat it in a mortar, and baked it in pans, and made cakes of it: and the taste of it was as the taste of fresh oil" clearly indicates the lichen form. It may be mentioned that though the scene of the manna occurrence is now a dreary desert there is evidence that this was not the case then, but that a luxuriant growth of trees, including the tamarisk, and other herbage, flourished. We know that the Israelites were able to maintain large flocks and herds.

Mustard. There can be no doubt, I think, that the plant known to us as mustard (*Synapis nigra*), is not the plant referred to in our Lord's parable (Matt. 13 ch., 31-32). "A grain of mustard seed . . . . which is indeed the least of all seeds; but when it is grown, it is the greatest among herbs, and becometh a tree, so that the birds of the air come and lodge in the branches thereof." The other evangelists give the narrative in similar terms. Christ's description answers well for a tall tree allied to the olive *Salvidora Persica,* which grows freely in different parts of Palestine, and the seeds of which are called *"Chardal"* the Arabic for mustard. When ground they are used as such.

Wormwood (*Artemisia monosperma*) a native of Palestine. The Hebrew word *laanah* is a term applied to any bitter herb and more particularly to *A. monosperma* a plant noted for its bitter taste. This plant is commonly grown in cottage gardens in Britain where it is popularly called "Southernwood." In Australia it is known by the same name and also as "old man."

The plant is used symbolically (Deut. 29 ch., 18) "lest there should be among you a root that beareth gall and wormwood," and Heb. 12 ch., 15, "lest any root of bitterness springing up trouble you," to express that which is odious or deleterious spiritually. Again (Lam. 3 ch., 15, 19) "He hath filled me with bitterness, he hath made me drunken with wormwood" and "the wormwood and the gall," refer to the stupefying effect of wormwood. The mixture offered to Christ on the cross has already been mentioned. The way of the wicked is likened to wormwood (Prov. 5 ch., 4) and in the description of the great plague (Rev. 8 ch., 11) the third part of the waters became wormwood. Another species (*A. absinthium*) constitutes the principal ingredient in the stupefying French drink absinthe.

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*See article by E. Cheel—Aust. Nat. iii., 122.

Perfumes and Incense. Most of the perfumes and allied articles used in the religious ceremonies of the Jews were imported from India or Arabia. Spikenard consists of the dried shoots of *Nardostachys jatamansi,* a plant from the Himalayas. It is best known as the chief ingredient of the "ointment of spikenard very costly" with which Mary anointed the feet of Jesus (John 12 ch., 3). The aloes of the Bible had no relation to our bitter aloe, but was a sweet scented resin yielded by an Indian tree, (*Aquilaria agallochum*). Myrrh is a gum resin the product of *Balsamodendron myrrha* an Arabian plant, and was an essential ingredient in preparing the holy oil for use in the Tabernacle (Exod. 30 ch., 23). Frankincense, another fragrant gum-resin was derived from the sap of *Boswellia Carteri* of Arabia. It was an ingredient of incense. Balm of Gilead, a product of *Balsamodendron gileadense* a native of Arabia and Africa. Tradition says that the plant was given to Solomon by the Queen of Sheba and planted by him in the plains of Jericho. The judgment on Israel is pathetically closed by the Prophet (Jer. 8 ch., 22), "Is there no balm in Gilead? is there no physician there?" and again (Jer. 46 ch., 11), and in other places, it is used in a similar sense. It was a mixture of myrrh and aloes that was provided by Nicodemus for the purpose of embalming the body of Jesus (John 19 ch., 39). Cinnamon and Cassia were ingredients of the Holy oil or ointment of the Tabernacle (Exod. 30 ch., 23). Saffron, the dried stigmas of a crocus (*C. sativus*) is with spikenard mentioned in Song. Sol. 4 ch., 14, as growing in the garden of fountains.

Prickly plants. A considerable number of Hebrew words are indifferently rendered "bramble," "brier," "thorn," "thistle," but as the use is always figurative, it is probable that no particular one of these is meant.

Interest naturally centres around the plant which composed the crown of thorns used on that sad and memorable day on Calvary 1900 years ago. Various plants have been suggested, but by far the most probable is *Zizyphus spina-Christi,* which grows freely about Jerusalem, and has long flexible branches bearing sharp thorns. It is the same plant that was used by Gideon to chastise the men of Succoth (Jud. 8 ch., 7, 16).

Calvary Clover. There is an interesting trefoil (*Medicago maculata*) native of the Mediterranean basin, which has a red or brown spot on each of the leaves. The legend popularly attached to it is, that growing at the foot of the cross, drops of Christ's blood fell on the plant, and that ever since then it has borne this mark of distinction. The twisted, spiny seed vessel is supposed to bear a resemblance to a miniature crown of thorns. *M. maculata* is a common introduced garden weed about Sydney.

The Cross. We have no record of the timber used in making the Cross. It is probable that one of the trees growing locally would be chosen, either the Cedar or Aleppo pine, probably, I think, the latter. There is a very old legend in Britain that it was the elder (*Sambucus nigra*) or as it is called in Scotland the "bourtree," and magic properties were accorded to it. An ancient Scottish rhyme is:—

"Bourtree, bourtree, crooked song,
Never straight and never strong;
Ever bush and never tree,
Since oor Lord was nailed on ye."

This tree however is not native to Palestine.

Saltwort, Soap. In two places only is there mention of soap. Jer. 2 ch., 22, says "For though thou wash thee with nitre, and take thee much soap, yet thine iniquity is marked before me, saith the Lord God," and Mal. 3 ch., 2, "for he is like a refiner's fire, and like fuller's soap": The first of these refers to an herb *borith* or saltwort (*Salsola Kali*) which was burnt and the alkaline ashes used for cleansing purposes. The reference in Malachi translated "fuller's soap" probably refers to an unctuous earth, steatite or "soap-earth." It was probably a supply of this substance that was given by Elisha to Naaman the leper "two mules burden of earth" (2 Kings 5 ch., 17). This earth is still used in the east for softening and cleansing the skin.

Fuller's earth was used by the Romans for absorbing the grease from cloth woven from raw wool, which was afterwards washed to remove the soiled earth. As late as the beginning of the 18th century this method was in use in Rome. The first real soap appears to have been prepared by boiling goat tallow with leached wood ashes. This is mentioned by Pliny in the 1st century.

Let me conclude with a reference to the orange and lemon. It struck me in working through the plants of the Bible that there is no reference to these prominent fruits. The reason of this is that they were unknown in Bible times in the Mediterranean. The Greeks and Romans were familiar with the citron, which was known as the "median apple," but they did not have the orange and lemon. It was only between the 12th and 13th centuries that the latter fruits were introduced to western Asia from India, and spread from there to Europe, being taken to Spain by the Arabs.

After being polluted for centuries by Turkish misrule and oppression, brighter times seem now in view for the land hallowed by so many sacred associations, and we may now, let us hope, look forward to the time foreshadowed by Isaiah (Isa. 55 ch., 13) when "instead of the thorn shall come up the fir-tree, and instead of the brier shall come up the myrtle-tree, and it shall be to the Lord for a name, for an everlasting sign that it shall not be cut off."

Through the courtesy of the Government Botanist the lecture was illustrated with a large series of fresh and herbarium specimens of the plants dealt with.

PENNANT HILLS GULLY. Those of our members who joined in the excursions to Pennant Hills in 1892 will learn with regret of the devastation which has taken place in the charming gully which we then visited. On 3rd January, of 1924, I paid a visit to the place and was shocked to see the wreck which has been made by men cutting down timber. The spots which were burnt out just before our second visit had regrown, *Angophora cordifolia,* in particular, having made fine growth, but many of the beautiful tall gums have been cut down and the rock pools and part of the bed of the stream are filled with branches and leaves, presenting a deplorable sight. Even the large log on the pic-nic ground has been cut up and removed. The most prominent flowering plants I found to be, in addition to *A. cordifolia, Tristania laurina* and *Lomatia silaifolia.* All over the pic-nic ground the large burrowing wasps (*Salius bicolor*) were busy throwing the sand out of their burrows, a most interesting sight.

THOS. STEEL.

OUR NATURAL HISTORY AND WILD FLOWER EXHIBITION.

By DAVID G. STEAD, Honorary Organiser.

In organising this Exhibition I aimed at making it something unique in our history. It was hoped to do at least fair justice to the floral section while greatly extending the scope of our efforts so as to indicate to both members of the Society and to the general public, something of the wide field covered by the Society's work in Science and Education.

With the aid of many members—past and present—and with the splendid assistance of our associates in University and Government circles, it was possible to achieve a widely-acclaimed success. On all sides was to be heard but one lament: "What a pity the Exhibition is open for such a short time." I bring this prominently under the notice of the Society right at the outset, because undoubtedly we must consider in future shows of this kind, means of conducting them in such a way as shall enable both members and the general public to reap the fullest benefit possible by way of scientific education and recreation. That means, in effect, that we must maintain the Exhibition daily—and all day—for at least one week. It is worth all the effort that we can put into it, for unquestionably it is one of the finest means that could be devised for carrying out the work that was our principal reason in founding the Society.

The Director of Education, the Chief Inspector of Schools, three Ministers of the Crown, several University Professors, members of the teaching staffs of Colleges, great Public Schools and Technical College, as well as many others of note in Education and science, all passed high encomiums upon our work and without exception referred to its utility and the pity that such an Exhibition should be open for such a short time as two days.

Yet still it is true that one must crawl before he walks!

Through the courtesy and kindness of the Minister for Education and of the Director (Mr. S. H. Smith) the fine Exhibition Hall of the Education Building, in Loftus Street, Sydney, was made available for our Natural History and Wild Flower Exhibition on the dates of the 17th and 18th October, 1923. This handsome and commodious hall is disposed in two wings—the smaller (facing Loftus Street) being about 44 ft. in length, by a width of about 35 ft., while the larger is 96 ft. in length with a width of about 35 ft.

At first sight it seemed rather a forlorn hope to be able to do adequate justice to the large space available in such a short time as we had at our command—bearing in mind, too, that everything would have to be put in position on the morning of our opening day. That we were able to not merely fill this space completely, but to work into it a grand exhibition of surpassing value and interest speaks volumes for the wonderful cooperation of those previously referred to. Bear in mind that we had a floor space of about 4,900 square ft. to cover, and a wall space of about 3,000 square ft. Having been designed for the purposes of an Art Gallery, these rooms lent themselves admirably for our purposes, as our exhibits naturally included both wall and floor specimens, as well as maps, drawings, paintings, photographs, etc.

The lesser hall was used for our Wild Flower section—and a lovely picture it made when filled with an array of many species of our native flowers from far and near, arranged in about 320 vases. On the walls here were Mr. Forster's paintings of Orchids and other Australian flowers, with many lovely and wonderful Nature photos, Mr. Neville Cayley's paintings, and illustrations of insects, birds and mammals arranged by Mr. Cayley in conjunction with our good friend, Mr. George Robertson (Messrs. Angus & Robertson). The *tout ensemble* here, as one entered, was very pleasing, and made a highly favorable impression upon the large numbers of the public who attended.

Passing from this hall to the larger one, we met immediately a vista of aquaria, museum showcases, tables of specimens, and walls adorned with a multitude of fascinating exhibits which might have well ornamented a permanent exhibition, and might have held the attention of the public for a very long time. Space forbids a full description of this portion of the show or of the crowds of delighted people—young and old—who wandered (many with notebook and pencil always in use) with excited interest from one exhibit to another.

The Exhibition was formally opened by the Honorable Sir Joseph H. Carruthers, LL.D., K.C.M.G., who made a most inspiring speech. He referred to the good work being performed by the Naturalists' Society in educating the people, and in assisting to keep alive a public interest in our wonderful flowers and wild life—which he termed the "Soul of Australia." He deplored the spirit of vandalism which so often reared its head in our midst—even in high places—and which was responsible for the destruction of so much of our native fauna and flora. In this connection special reference was made by Sir Joseph to the shameful destruction of age-old trees in our National Park area.

The Hon. J. C. L. Fitzpatrick, M.L.A., Minister for Local Government, also spoke at the official opening—specially commending the Society for its work.

Following is a list of exhibitors, with, also, a brief reference to the exhibits themselves:—

1. Dr. C. Anderson (Director, Australian Museum): Ethnological collection illustrating implements of Australian aborigines.
2. Mrs. Aurousseau: Paintings of flowers of Western Australia.
3. Australian Gaslight Co.: Collection showing the valuable economic derivatives of coal: Coke, Refined tars, Duratar Asphalt, Pitch, Carbolic, Fuel and Neutral Oils, Benzola Motor Spirit, Solvent Naptha, Sulphate of Ammonia, Napthalin, etc. A most useful and instructive collection specially prepared and mounted for our exhibition.
4. Mr. M. S. Barnett: Examples of sugarcane grown near Sydney.
5. Mr. Henry Burrell: Nature studies (photo enlargements) of Australian birds and mammals.
6. Mr. H. J. Carter: Australian jewel-beetles (Buprestidae) and pie-dish beetles (Tenebrionidae). Some from the drier regions of Central and Western Australia.
7. Mr. George Card (Curator, Mining Museum), by courtesy of the U.S. Mines Department: (a) A select collection of minerals of special importance to man at the present time; (b) series of specimens illustrating geographical changes in Sydney District in past geological ages; (c) life-size restoration of some early types of pre-historic man, etc.
8. Mr. J. Neville Cayley, with Messrs. Angus & Robertson: Paintings and photos of birds, mammals, and insects of Australia. (Originals of illustrations in works about to be published.)
9. The President (Mr. E. Cheel), by courtesy of the Government Botanist, Mr. J. H. Maiden: (a) General collection of herbarium specimens of Australian trees and lesser plants; (b) paintings by Miss Margaret Flockton, and other plant illustrations, etc. (Included in this collection were some of Mr. A. A. Hamilton's studies in plant ecology, leaf variation, etc.)
10. Mr. A. H. Chisholm: Outdoor nature studies (photos) in Australia.
11. Professor L. A. Cotton: Selected geological specimens of economic importance, geological bas-reliefs, and large wall-diagrams of geological sections covering large areas of New South Wales.
12. Miss Deer and Mrs. Roach (by courtesy of the Principal of the Teachers' College, Professor Mackie): (a) Students' nature-study collections; (b) wall diagrams of animal and plant studies.
13. Miss H. Drummond: Geological specimens, including fossils.
14. Mr. W. S. Dun (by courtesy of Under Secretary for Mines): Australian fossils.
15. Dr. E. W. Ferguson: Disease-carrying insects.

16. Dr. A. E. Finckh: Native flowering plants, grown in a private garden. This attracted the great attention which it deserved. We are hopeful that it will greatly stimulate interest in the preservation of our lovely flowers.

17. Mr. H. E. Finckh: (a) Living fishes and plant-life in aquaria; (b) kookaburra study in lantern slide photos.

18. Mr. A. Forster: Paintings of orchids and other Australian flowering plants.

19. Mr. W. W. Froggatt: Entomological collections. Mr. Froggatt also contributed a number of mounted coconut beetles, which were sold at 6d. each as mementoes of the Exhibition and helped to swell our funds.

20. Miss Fuller: Student's collection of insects. We would like to have seen more of our young members follow Miss Fuller's excellent example.

21. Mr. L. Gallard: Miscellaneous insect collection; from Sydney district chiefly.

22. Mr. G. M. Goldfinch: Australian moths and their transformations.

23. Mr. W. B. Gurney (Government Entomologist), by courtesy of Director of Agriculture: Economic entomology—including wood-borers, parasitic insects, etc. We were also indebted to the Director of Agriculture for the use of several glass cases.

24. Mr. H. R. Harrington: Photo-micrographic apparatus and rock-slitting machine, made by himself.

25. Mr. A. G. Hamilton: Aboriginal spearheads made from glass.

26. Professor L. Harrison: Microscopes and slides of biological subjects, microtomes and other apparatus, as well as Nature photos arranged in conjunction with Mr. Burrell.

27. Mr. G. Hooper (Curator, Technological Museum); (a) Timbers showing beauty of Australian woods for cabinet work; (b) commercial timbers showing ravages of principal borers; (c) made articles showing suitability of Australian timbers; (d) Australian essential oils; (e) a number of Mrs. Ellis Rowan's pictures of Australian flowers. (This collection attracted great attention from students and from lads employed in a number of Sydney factories.)

28. Mr. A. Basset Hull: Australian chitons.

29. Professor Hunter: (a) Series of endocranial casts, to show progressive development of the human brain; (b) typical specimens of skulls of Australian aborigines; (c) casts of heads of Australian aborigines; (d) typical skulls from New Guinea and surrounding regions; (e) skulls of various fossil men.

30. Professor A. A. Lawson: (a) Special botany exhibit, including mounted fossil-plant transparencies—showing general structure; (b) "rotary" microtome, at work, illustrating plant-sectioning for the microscope.

31. Mr. A. S. Le Souef: Series of photos illustrating the life-history of the kangaroo mouse (Notomys cervinus), and pictures of Australian animals.

32. Mr. L. Lippmann: Variations of the Australian silkworm moth (Antheraea eucalypti).

33. Miss C. N. Macindoe: Mounted specimens of Western Australian flowers.

34. Mr. I. M. Mackerras: Collection of Australian flies

35. Miss McAnene: Books of pressed and named wild flowers; the work of pupils of Mortdale Public School.

36. Dr. J. McLuckie: Set of microscopes with plant sections and other microscopical (botanical) exhibits.

37. Mr. Ramsay: Nature photos and enlargements.

38. Professor Griffith Taylor: Wall-diagrams of Australian geographical subjects.

39. Mr. David G. Stead: Selections from a fisheries-ethnographical collection made in the Malay Peninsula and Sumatra, while Special Fisheries Commissioner to the British authorities.

40. Mr. G. J. Waterhouse: Australian butterflies and their variations; with also paintings showing the life-history of several species.

41. Mr. W. Rhodes Wood: Living examples of aquatic insects in specimen-jar aquaria—complete with plant-life. This valuable series represented the efforts of pupils of Manly Superior Public School.

42. Mrs. E. H. Zeck: Living water-plants in a jar.

43. Mr. E. H. Zeck: Insects of special interest and original drawings of insect subjects.

In the Wild Flower section we were indebted to many helpers. President W. J. Millner, of the Water and Sewerage Board, kindly allowed members of the Board's staff at Cataract to collect flowers in that area. Then the Queensland Naturalists' Society sent flowers from Stanthorpe, and the Barrier Naturalists' Club sent from Broken Hill. Mr. Charles Dick sent from Port Macquarie, Miss McAnene from Mortdale district, and Mr. Barnett, Miss Rose Winter, Mr. George Card, Mr. O. Evans, and Mr. Uhr contributed welcome supplies from local sources. Mr. E. H. Ising, the Honorary Secretary of the Field Naturalists' Section of the Royal Society of South Australia, who has helped us in other ways, heard of our Exhibition too late to give us help from Adelaide. In this section we were principally indebted to Misses T. Harris and H. Butler, whose unremitting attention made so much for our success. These ladies also contributed flowers. Mrs. Finckh, Mrs. Howell, Miss E. Gough, Miss Winter, Mrs. Jenkins, Miss Drummond and several young ladies from the Teachers' College all gave yeoman service in the Wild Flower section. Mrs. Finckh also helped greatly with the cash register at the door—relieving Miss Le Plastrier and Miss M. Holland in what was, perhaps, the least interesting part of the work.

Through the kindness of Miss McAnene, a team of child bird-mimics from the Mortdale School branch of the Gould

League of Bird Lovers gave imitations of some well-known birds on the evening of the 18th October. Mention should be made also of the kindness of the head master of Fort Street Technical School, who, allowed six of his boys to help us in arranging our exhibition. These lads gave us most willing and invaluable assistance.

The list of willing helpers is by no means exhausted, and I trust that anyone who has been omitted by name will take the thanks that we give them individually and collectively for their aid. In this connection I might mention that although many vehicles were employed in bringing exhibits to the hall, this Society did not have to pay for any. This contributed largely to the financial success of the undertaking. While we are not greedy for "profits," it is clear that we have, necessarily, to make the thing "financial" if we are to continue the good work. Even the cash register was kindly loaned to us by the National Cash Register Co. The charges for admission to the Exhibition were: Children 3d., and adults 1/-. Adults could purchase season tickets for 2/-.

ORDINARY MEETINGS.

September 4th.—Mr. H. E. Finckh in the chair, and a good attendance. A communication from the Queensland Naturalists' Society asking for contributions for their flower show, was submitted. Several members promised flowers, and Mr. Finckh undertook to see to the transmission of the exhibits to Brisbane. The chairman explained what had been done in connection with the appointment of a representative of the Society on the Committee for the protection of the wild fauna. Mr. C. Kennedy was elected a member.

Mr. T. Steel then gave a thoughtful and most interesting lecture on:—"The Plants of the Bible," illustrated with a large series of fresh and herbarium specimens of the plants dealt with. The nature of the lecture and the exhibits made the whole of more than usual interest. A vote of thanks was moved by Mr. Watson, who referred to the vast amount of work involved in the preparation of such a lecture. Seconded by Mr. Parry and carried by acclamation.

Mrs. Jenkins exhibited columnar sandstone, and asked for an explanation of its formation. Mr. Steel explained that this structure was induced by intense pressure caused by intrusive igneous rock, and that good examples occurred at Bondi; also that the similar structure of coke in coke ovens, was due to the pressure caused by the swelling of the coke during the process of coking. Mr. Uhr had a fine collection of native flora from the coastal district, some of the blooms being remarkably fine, evidently as a result of the recent copious rains.

October 2nd.—The President (Mr. E. Cheel) in the chair, and a moderate attendance.

The President referred to the death of the late Governor, Sir Walter Davidson, and also to that of one of the active members of the Society, Miss H. M. Crispo. The meeting showed its sympathy in the loss of His Excellency, by standing in silence. A similar expression of sympathy with the family of Miss Crispo was passed, and the Hon. Secretary was instructed to convey the same to the family. Miss Haylock was elected to membership. Mr. Cheel exhibited a white flowering form of the Wanga vine (*Tecoma australis*), also some flowers of a hybrid *Callistemon acuminatus* X *C. lanceolatus,* and *Swainsona galegifolia,* all of which he had cultivated in his garden at Ashfield. Miss Le Plastrier Nitella collected in a creek at Killara also Fimbriaria in fruit. Mr. A. A. Hamilton *Acacia rubida* and *A. Hamiltoni.* Mrs. Howell *Loranthus celastroides* on *Casuarina suberosa.* Mr. Gallard winged and wingless forms of Embiidae with notes. Mr. Froggatt presented to the library a copy of his valuable book on "Forest Insects," for which a hearty vote of thanks was passed by acclamation. Mr. D. G. Stead then gave a most interesting account of Malaya and its peoples, illustrated by many exhibits which he had brought back from his visit there.

November 6th.—The President (Mr. Cheel) in the chair, and a good attendance. Mrs. Gillham, Miss M. Raymond and Mr. F. B. Barnett were elected members.

Miss McAnene exhibited Rhodanthe Manglesii from W. Australia. Miss Butler *Callistemon linearis* collected at Edgecliffe. The Hon. Secretary example of remarkable fasciation in foxglove, with notes. Mr. Forster *Clerodendron tomentosum, Leptospermum flavescens, Marsdenia suaveolens, Backhousia myrtifolia, Helichrysum diosmifolium, Loranthus longifolia* and *Notelia* sp. Mr. Watson described his experience with single-flowering stocks, and Mr. Cheel gave explanatory remarks on single-throwing and double-throwing, and on ratio of singles to doubles, instancing the work of Miss Saunders of Great Britain. Mr. A. A. Hamilton also spoke on the fixation of variations.

Mr. Barnard then gave a most interesting lecture on "Plant life under past climatic conditions." Mr. Cheel spoke on the question of determining fossil plants from the impression of leaves, and said that even with living plants it was impossible in many instances to determine the generic rank by leaves alone.

December 4th.—The President in the chair, and a good attendance. A letter from the Australian Forest League asking for affiliation was, after discussion, referred to the Council for decision. Mr. D. G. Stead then gave a fine lecture on Malaya, coastal and inland, illustrated by lantern slides. Miss Lippmann exhibited a case of Hawk moths (*Sphingidae*). Mr. Mackerras a case of flies, illustrating mimicry and divergence in the Diptera many of the harmless flies exhibited having a marked resemblance to wasps and robber-flies. Mrs. Jenkins *Castanospermum australe* in flower. Miss Winter *Cordyceps Robsoni* on caterpillar from N.Z., also corals and molluscs from Fiji.

FASCIATION IN DIGITALIS. At the November meeting, the Hon. Secretary, Miss Le Plastrier, exhibited a flower spike of foxglove (*Digitalis*) which she had grown in her garden at Lindfield, and by experiments extending over four flowering seasons, i.e., eight years, had arrived at an approximation of the ratio of variation. The first seedlings were found growing on a bank, being from seed that had blown from a garden, the young plants were ill-nourished and not many of them survived, but of those which did a small number, two or three only showed signs of fasciation. The seed of these was not collected, but allowed to scatter, the seeds of the others being removed. That flowering was in 1917. The next flowering was in 1919, when about one in four of the plants fasciated, and in two cases two side blooms showed signs of separating the petals. In the flowering of 1921, this was even more marked, while in the specimen exhibited there were two flowers, one on each side of the flattened axis, and at the same level, which had separated their petals into two large rosaceous ones, while eight stamens were developed. The flowering of this season (1923) showed almost an equal number of fasciated plants, but, as fewer had been allowed to reach the flowering stage, this may not be reliable. The specimen was cut from a stalk of three, and a half feet high, the flattened axis measured over two inches, and was so thickly covered with flowers that no part of the upper axis was visible except at the very top.

NATURALISTS' SOCIETY OF N.S.W.

Teachers' College Branch.

Members of the Society will be interested to hear that a student's branch has been formed at the Teachers' College, Sydney. The object of the branch is to promote an interest in nature study amongst students and teachers, with an attempt to assist in the improvement of the teaching of Nature study in our schools. It is hoped that members of this branch will become members of the Parent Society when they leave the Teachers' College, and, as many of them will proceed to the country centres, I think the Naturalists' Society can look forward to a number of very interesting correspondents in the immediate future. Already a number of students have shown a keen interest in the Society, and seem anxious to share in its work.

Mr. A. G. Hamilton, who has been an active member of the parent Society for many years, and who, as a lecturer in Nature study at the Teachers' College, has always shown a keen interest in the welfare of the students, has consented to act as President to this branch Society, and with such a leader, I think the Society can rest assured of a successful year.

On Friday, October 19th, the inaugural meeting was held at the Teachers' College, when the President, Mr. A. G. Hamilton, gave a lecture of absorbing interest on "Australian Orchids." Mr. Hamilton not only showed a great number of beautifully coloured lantern slides, but he also explained many points with regard to the life-history, and the pollination of many of the orchids, which we know so well, but about which we know so little. We are very much indebted to Mr. Hamilton for this exceedingly interesting lecture.

On Friday, November 9th, it is proposed to hold an excursion to Kurnell.

THISTLE Y. HARRIS, Hon. Sec.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

ORDINARY MEETINGS.

February 5th.—The President (Mr. E. Cheel), in the chair, and a good attendance. Misses Hewison, Bruce and McFadyen and Mr. Gillings were duly elected members. An instructive and interesting lecture,—"Popular notes on the Salt-bush family (Chenopodiaceae)" was delivered by Mr. R. H. Anderson, B.Sc. Agri., stressing especially those genera having economic value, as *Chenopodium, Atriplex,* etc.

Mr. Forster exhibited beautiful water colour paintings of Kosciusko plants collected by Misses Harris and Butler. Mr. Gallard read a note on the life-history of the parasitic wasp *Goniozus antipodum,* illustrated by specimens and micro-photo slides by Mr. Harrington.

Mr. Froggatt parasites of the timber borers belonging to the Cleridae with descriptive notes. Master T. Howell, *Boletus granulatus* and *Agaricus sylvestris,* both edible, the former being prized by Italians as a delicacy. Miss Le Plastrier branch of *Acacia implexa* from Lindfield (shale) showing more luxuriant blooms than at any period for eight years, also micrographic slide (Mr. Harrington) of *Xanthorrhoea minor* section stained and photographed in colour. Mr. O'Hare *Calla* showing double spathe, the smaller within the larger but in a different sense. The President seedlings of Eucalypts illustrating different form of cotyledons and other growth characteristics under similar treatment:—*E. globulus, E. transcontinentalis* and *E. Maideni* having emarginate cotyledons; *E. uncinata* with Y shaped cotyledons; *E. ficifolia* with entire cotyledons, and in a pan of 23 seedlings one was found to be tri-cotyledonous and the first true leaves in a whorl of three.

NOTES ON THE HABITS OF CERTAIN ORCHIDS.

By Rev. H. Rupp.

I. *Eriochilus autumnalis,* R.Br. I have specimens of this orchid from the following localities: New South Wales—Barraba; Lane Cove River; Moruya; Alum Mountain, Bulahdelah; Topi Topi (Myall Lakes). Tasmania—Swan Point (Tamar River); Launceston; Middlesex Plains (Western highlands). It appears to me to be unusually sensitive to climatic conditions. One generally looks for widely-distributed plants early in the season in warm climates, and late in colder districts; but with some autumn-flowering plants this order is reversed, and *Eriochilus* is a good example. In Tasmania it may be found late in January, though in warm spots with plenty of shelter I have seen it in April. February is its favoured month there. From Sydney down the south coast of N.S.W. it is at its best from the middle of March to the middle of April. Further north it rarely appears before April, and may be found as late as June. Thus it seems to adapt its habit to secure approximately the same temperature for its flowers everywhere. Normally it is very slender and small, only conspicuous by its white lateral sepals. Near the Myall Lakes of N.S.W. a larger and more robust form occurs in swampy Melaleuca country. The plants there may reach 12 inches in height, with two to five quite handsome flowers, the lateral sepals being sometimes rosy red. In Moore and Betche's Handbook of the Flora of N.S.W. the leaf of this orchid is described as withering away before flowering-time. This appears to be a mistake. In my experience the leaf is always present, but is immature; when the flowers have faded it grows much larger, and persists throughout the winter.

II. *Chiloglottis diphylla,* R.Br. I have specimens from Lane Cove River and Bulahdelah, N.S.W.; Lindisfarne (Derwent River) and Launceston, Tasmania. Like *Eriochilus,* this may be called an autumn-flowering plant, but it is erratic in this respect, and less sensitive to climate. I found it flowering at Lindisfarne, opposite Hobart, in June: about Launceston in April only: at Bulahdelah in May and June: along Lane Cove River from April to June. The Launceston form is taller and more robust than any other I have seen. The flowering-time of any particular "patch" is brief, and this fact, together with its inconspicuous form and colour, may account for frequent failures to find flowers. It is very common in many parts of Tasmania, but often seems to miss flowering. Patch after patch may be found without any sign of a flowering-stem; then may come one with scores of plants in bloom.

III. *Chiloglottis Gunnii,* Lindl. My specimens are from Bunninyong, Victoria; Hobart, Upper Derwent, and Launceston, Tasmania. This quaint and attractive little orchid, with its comparatively large flower, out of all proportion to the size of the plant, is very common in Tasmania, mainly on the slopes of hills. The flowering time extends from September almost to Christmas. The colour varies from pale green in the early forms to very dark red-brown in the later. The flowering stem is rarely more than an inch or two in length until fertilisation is effected, when it may grow up to a height of 8 or 10 inches. This is not a constant characteristic: *i.e.,* the stem may remain quite short; but it frequently does grow out. It is not a merely local freak, for it occurs in Victoria as in Tasmania. This curious habit is shared by a species of *Corysanthes* (see below), and is probably an effort to ensure the scattering of the seed. On a hill-side near the Punchbowl, on the outskirts of Launceston, is a large patch of this species with many plants bearing two flowers.

IV. *Corysanthes.* I confess that the members of this genus have a special fascination for me. Most collectors bewail the impossibility of drying and pressing them satisfactorily, but with patience and care it can be done, and they do not lose their colour as so many orchids do. I have specimens of the following species:—*C. unginculata,* R.Br., from Lindisfarne, Tas.; *C. fimbriata,* R.Br., from Low Head, Tas.; *C. primosa,* R. Cunn., from Lane Cove River and Bulahdelah, N.S.W.; Warrnambool, Vic.; Derwent and Tamar Rivers, Tas.; *C. bicalcarata,* R.Br., from Bulahdelah, N.S.W. and Eaglehawk Neck, Tas.; *C. diemenica,* Lindl., from Derwent and Tamar Rivers, Tas. There appears to be some difficulty in distinguishing the various forms. *C. primosa, C. fimbriata,* and *C. diemenica* are regarded in some quarters as merely varieties of one species. Near Low Head, at the mouth of the Tamar River in Tasmania, in 1922, I found all three markedly distinct from each other. The following descriptions are compiled from notes made on the spot.

C. fimbriata.—Flowering June and early July, usually in damp, well-shaded places amongst bracken fern. "Hood" (dorsal sepal) pointed, sharply toothed, purple, densely spotted with darker purple. Labellum very dark purple from the throat outwards, especially along the middle portion, from which rows of spots of the same dark colour extend to the margin, which is strikingly fringed all round except at the base. Flower opening very wide, from half to over one inch in length from point of hood to end of labellum. Leaf strongly veined.

C. primosa.—Flowering July and part of August, in similar places to the last, but also in drier and more exposed areas. Hood not pointed, entire, usually purple but sometimes green or greyish. Central part of labellum white from the throat outwards for two-thirds of its length, with dark purple lines extending to the margin, which is sharply toothed or sometimes fringed. Labellum emarginate at the end. Flower rarely as widely open as in *C. fimbriata,* and seldom over ½in. in length from top of hood to end of labellum. Leaf-veins very faint.

C. diemenica.—Similar to the last, but margins of both hood and labellum quite smooth and entire. Hood and labellum dark purple except for the white central part of the latter, and less translucent than either of the former species. (When pressed, *C. fimbriata* and *C. primosa* show their markings beautifully if held before a strong light; *C. diemenica* is quite opaque). Flower never opening very widely, and margin of labellum turned up prominently. Generally but not always smaller than *C. primosa,* and flowering later.

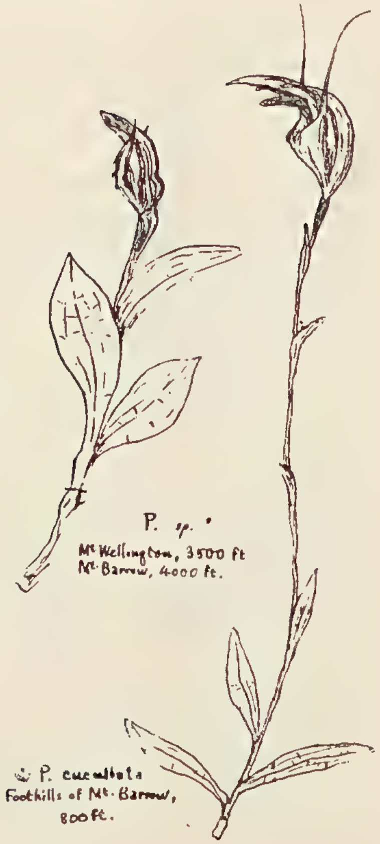
In Victoria and Tasmania I have found *C. primosa,* after the withering of the flower, with flowering-stems elongated as in *Chiloglottis Gunnii.* I have specimens from Relbia, near Launceston, with stems almost 9 inches long. When fresh these stems were of a delicate purplish-red tint.

In New South Wales I have invariably found *C. primosa* with the hood grey or green, spotted with purple and having a purple line along the centre. The labellum is not white from the throat, but about half-way along its length is a dusky patch surrounded by a whitish ring.

C. unginculata and *C. bicalcarata* are quite distinct from the others. The former has a longer flowering-stem in proportion to its size, and the flower before opening strongly resembles a little bird's head and beak. Like *C. bicalcarata* it never opens widely. The latter of course is easily distinguished by its two "spurs" at the tubular base of the labellum, and the great length of its hood. The flower is curved over so as to open downwards like *Pterostylis nutans.* The leaf may easily be mistaken for that of an *Acianthus.* On the Alum Mountain, Bulahdelah, there is a form (apparently rare) with flowers of a dingy white colour.

V. *Drakaea irritabilis,* Reichb.—My only specimens are from the lower slopes on the W. side of the Alum Mountain, Bulahdelah. The plant is fairly common in that locality, on moist ground mainly occupied by Melaleuca scrub. Moore and Betche's Handbook, in describing the genus *Drakaea,* says, "Radical leaves solitary or none, except a few sheathing bracts," and Mrs. Sulman (Wild Fl. of N.S.W.) describes it as having "solitary broad leaves." Neither of these statements is accurate as regards *D. irritabilis* at Bulahdelah. It has very prominent and well-developed radical leaves, from two to four in number, but usually three. They are not, however, attached to the flowering stem. When I first saw them, I took them to be leaves of a *Chiloglottis,* but as there were generally three, supposed it to be one unknown to me. Early in June, 1923, I found the flowers, and investigation proved that these leaves undoubtedly belonged to *Drakaea.* During the flowering stage they are developed imperfectly or not at all: when present, they are attached below the surface of the soil to the same tuberous root as the flowering-stem. On non-flowering plants they are developed very freely, attaining a length of one to three inches. On many flowering-stems there are small undeveloped buds along with the fully-opened flowers—usually on the lower part of the stem: and once or twice I have observed matured fruits among the flowers and buds. Apparently therefore the plant has a habit of holding buds "in reserve" to develop when conditions are favourable.

VI. *Pterostylis cucullata,* R.Br. *P. dubia,* R.Br.?—In November, 1919, during an excursion up Mount Wellington, Tas., I collected specimens of a *Pterostylis* with large flowers which grew in wet places at an altitude of about 3,500 ft. I could not place it satisfactorily under any species described in Mr. Rodway's Flora of Tasmania. Subsequently I found the same plant, at about 4,000 ft., on Mount Barrow, near Launceston. The flowers were withered (early January), but I do not think there could be any doubt of the identity of the plants with those of Mount Wellington, which I had again collected in November and December, 1920. Mr. Rodway seemed of opinion that it was a form of *P. cucullata.* I give the following description from the specimens now in my collection. Stem very stout and succulent, from 2½ to 6 inches high. Stem-leaves 3 or 4, very broad (½ to 1 inch), lanceolate. Upper lip 1 to 1½in. long, almost mucronate, the point short. Outline of the lower lip a rounded curve, never suddenly "bulging" as in *P. cucullata;* the lobes not (or barely) extending beyond the dorsal sepal; whole flower erect and only slightly curved in the upper lip; fruit rather large in proportion to the plant. In January, 1922, I collected a large number of specimens of *P. cucullata* from soft, sheltered bogs among the foot-hills of Mount Barrow, and I had the opportunity of comparing these with many plants of the same species obtained about the same time among the western highlands of Tasmania by Mrs. George Perrin, of Launceston. The


P. sp.
Mt Wellington, 3500 ft
Mt Barrow, 4000 ft.
P. cucullata
Foothills of Mt. Barrow,
800 ft.

only difference was that the Mount Barrow plants were larger. As compared with the plant just described, this form differs in the following respects: Stem always slender, 8 to 18 inches in height. Stem-leaves chiefly towards the base, rather narrow-lanceolate, the upper ones bract-like and small; 5 to 7 in number. Upper lip rarely less than 2 inches long, narrowed into a fine point, much curved over. Lower lip much bulging at the sinus, the lobes extending in fine points to an inch beyond the dorsal sepal. Fruit small and narrow. To these remarks I may add that in the Mount Wellington plant the dorsal sepal has a pronounced indentation not far from the base, which is not present in the other.

Mr. J. H. Maiden, in a letter to me dated 29/4/22, remarks that Bentham regarded Brown's *P. dubia* as a starved form of *P. cucullata,* but that further observations may enable the two to be kept as distinct. Whether the plant I collected on Mount Wellington and the higher levels of Mount Barrow is identical with Brown's *P. dubia* I am not in a position to say, but I venture to think there are greater specific differences between it and *P. cucullata* than those which separate some other acknowledged species. Even in the dried state the plants are very dissimilar, and the disparity is more marked in the living plants. It may be noticed that both are summer-flowering, but the high-level plant, living from two to three thousand feet above the other, has finished flowering when the other is just coming to maturity.

NATURALISTS' SOCIETY.

TEACHERS' COLLEGE BRANCH.

Excursion to Kurnell.

On Friday, November 9th, a small party of Training College students, under the leadership of Mr. A. G. Hamilton, embarked on an excursion to Kurnell. Catching the 2.15 p.m. launch from La Perouse the trip across the Bay proved very enjoyable, albeit the water was choppy under the force of a stiff westerly wind. On this account none of the water-loving species of life were observed.

Great was the disappointment of the party at Kurnell jetty, when they learned that permission to gather flowers in the protected area had been refused. However, as there was much to see, and (owing to the inconvenience of the launch service) very little time in which to see it, this slight gloom was soon dispelled by an all-engrossing interest, not only in the abundant flora, but also in the even more plenteous insect life.

Indeed, honeysuckle flowers could not be distinguished from their foliage without close scrutiny, because of thousands of hawk and noctuidae moths seeking seclusion there.

Vine moths abounded in every sunlit space and magnificent butterflies tempted the all too clumsy students to ensnare them. The most lethargic of these latter—*Precis vellida*— were "bottled" on a wholesale scale.

Kurnell, being sparsely inhabited, the billions of assorted flies and colossal mosquitoes—some of the latter outrivalling the renowned "Hexham Greys"—welcomed the party as fair sport. All efforts to engage in warfare with them were futile, for theirs was the upper hand from the first.

Frequently, in cleared spaces, a charming type of cultivated wildness met the eye. In one such place we came upon the "Kangaroo's foot," a flower which greatly impressed the students—none of whom had seen it before—by its grotesque beauty and which proved reminiscent of Western Australia to Mr. Hamilton, our leader.

Time sped away all too swiftly, so that after having explored merely the outside fringe of the bush, we were compelled to return to the launch, just as the afternoon was closing in upon us.

Kurnell shows much the same characteristics as Long Bay and La Perouse bushlands, with the single, but vastly important difference, that owing to the ban upon the all too rampant vandalism, apparent in the latter places, Kurnell has maintained a superior individuality.

It is well worth making an excursion to appreciate this fact. How much more so, if those in authority could be persuaded to grant "permission to pick" for one short day?

JEAN M. CAMPBELL, Hon. Treasurer.

NOTES ON GONIOZUS ANTIPODUM.

By L. GALLARD.

The specimens exhibited were bred in captivity from adults kept alive through the winter without any artificial heat. All stages of the wasp from egg to adult are present. The eggs are laid in numbers along the sides of its host, the Codlin moth grub. One specimen exhibited showed five young wasp larvae with their heads buried in the sides of their host, from which they suck the juices. When fully developed they loosen their hold and spin a white, silken, oblong cocoon in which to pupate. The wasp also attacks the peach-tip moth larva.

NOTES ON CLERIDAE.

By W. W. FROGGATT, N.S.W., Forest Entomologist.

The timber boring insects popularly known as "Pin-hole borers" and "Powder-post beetles" have a number of enemies amongst which are several beetles of the family Cleridae. The adult beetles hunt over infested logs and in some cases lay their eggs in the bark. The larvae, slender active grubs have stout jaws, three pairs of legs and usually a pair of horny processes on the anal segment. These bore through and follow up the burrows of the wood borer larvae. Other Clerids hunt the beetle borers themselves while they are cutting their way into the bark or sap-wood and devour the helpless beetle in its burrow before it has had time to lay its eggs.

Some years ago I worked out the life-history of our largest clerid *Trogodendron fasciculatum* the description being published in the Agric. Gag. N.S.W., and in "Forest Insects of Australia." This beetle is a very important check on the longicorns belonging to the Phoracantha group, and in the Moruya district in the spotted gum forests I found its host was chiefly *Epithora dorsalis,* the slender bodied longicorn.

During the last month I have collected a large series of this handsome beetle on the freshly fallen logs of the spotted gum (*E. punctata*) in our southern forests. The beetles fly about in the hottest sunshine, walk over the logs with their bright yellow antennae constantly moving from side to side and are absolutely fearless, never attempting to fly, but when one attempts to pick one up it turns round and bites with its powerful jaws. This habit is so well known to the timber getter that he will not touch the beetle. The bright yellow antennae and shining black wing covers are doubtless warning colours for protective purposes, even causing birds to pass them by.

The Powder-post beetles (*Lyctus* sp.) are heavily parasitised by the larvae of the "White-barred clerid" (*Paratillus carus*) which are very numerous in the parallel tunnels of the wood borers. The handsome little beetles with their reddish head and thorax and blue-black wing covers crossed with a fine white transverse bar, just above the base of the hind legs, can be bred out in numbers from any infested sapwood. They are not only common in the forest, but are frequently met with in the city timber yards running over the sawn timber. The "Shot-hole borers" (*Tomicus* and *Bostrychus*) are also considerably reduced in number on the tree trunks by the active ferret-like Clerids belonging to the genus Cylidrus. Two species are common in our hardwood forests and I have on several occasions found them both actively engaged devouring the helpless thick-set little *Tomicus solidus* while he is excavating his burrow and cannot turn round. *Cyliderus nigrinus* the largest, is of a uniform shining black, slender in form with the usual clubbed antennae and large powerful jaws. *Cyliderus basalis* is of a similar form with shining black tints, but has a broad red band across the upper half of the wing covers and is about two-thirds the size of the other.

EXCURSION TO LUGARNO FERRY.

On the 16th June, 25 naturalists arrived at Penshurst, en route for Lugarno Ferry. Finding no 'bus to take us to our destination, we had to uphold our name as field naturalists' and walk, walk, walk! This we did without noticing the distance, as our attention was constantly being drawn to something of botanical interest by our leader, Mr. E. Cheel. A somewhat dull day and crisp atmosphere were all in our favour, so we talked and walked, listened and learned; or let Nature herself speak to us in her own language.

We soon left behind the modern little township and came to the less populated places. Here our leader drew our attention to *Acacia prominens* growing in an old garden. Penshurst is the home of this acacia, and later on our journey we came across some fine specimens. It was so named owing to the prominent gland on the edge of the phyllode. As yet we have not solved the problem of these glands. That they are mere ornaments we do not believe, for Nature never does things haphazardly. Ants are often seen at these glands, so we presume that the acacia gives off some substance which is apparently valued by the ants. Or maybe the ants do some beneficent service to the plants which we, as yet, have not fathomed. In any case the plant and insect are on friendly terms with each other, and they must surely be working together for some purpose.

Coming to the more open country we found the relics of a past prosperity, such as stately old pines, which were evidently used as a break wind in the earlier settlement of the district. Then we came across the remains of old gardens, now gone to decay, and leaving only a few trees; these stood out in relief in the undulating country.

Dotted here and there were Turpentine trees, *Syncarpia laurifolia*. These, too, are natives of the district. They were covered with their queer shaped united fruit, and we soon busied ourselves getting specimens.

A close lookout was kept for a lone Kurrajong, **Brachychiton populneus* or *Sterculia diversifolia*. This was located by Mr. E. Cheel in 1901, and no other specimen has been found so near to Sydney as this one. We eventually found it, and a grand old warrior it is! It is showing the usual signs of age;

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*See A.A.A.Sc. (1913) 318.

however, its light green foliage shines forth in contrast to the nearby eucalypts. On the bole of this tree we found some interesting lichens. *Ramalina yemenesis,* an Hepatic, and **Stictina Mougeotina* var. *xantholoma.* The latter is only to be found on the Kurrajong. We also found a few of the fruit under the tree.

In this same locality *Eucalyptus longifolia,* the woolly butt was identified by Mr. E. Cheel.

Leaving Peakhurst behind us we practically walked into the country, along a winding road, thick with red dust, and bordered by the flowers, shrubs, and trees so familiar to us all. This was our hunting ground. We were advised to be on the lookout for *Styphelia laeta,* a greeny and yellow "Five Corner." This is particularly interesting owing to its hispid twigs, which distinguishes it from the other species, together with its smaller corolla tube.

Acacia discolor with its mass of yellow fluffy balls was "A thing of beauty" standing out in relief amidst everything else. The origin of its specific name is hidden in mystery. Whether it was named because the upper and under side of its leaves are of two colors, or because some shrubs bear pale yellow flowers, while others a much deeper shade, is an open question.

Trees now became the dominant feature of the landscape. *Eucalyptus haemastoma,* the white scribbly gums with their well defined boles towered up above us, while *E. pilularis,* the black butt, growing side by side stood out in striking contrast—there was no mistaking its black bole.

Here a halt was called and busy hands soon had a fire made and the billy on for tea. Then some of the party having a mental image of Lugarno Ferry wanted to see it in reality, so off they went.

Along the top of the ridge *Hakea dactyloides* and *Casuarina suberosa* (covered with fruit) grew in profusion. Here, too, we found *Notothixos incanus* growing on a Loranth, upon which it is only to be found. Flowers, trees, shrubs and vines vied with each other in their effort to beautify the scene, and they revealed to us the manifold variety of Nature's dress.

Now our road began to descend to the ferry. It was steep, narrow, and winding, and for a greater part of the way was bordered by a sliprail fence. On this fence we found one of the Fungi, *Polyporus ochroleuca,* an ochre coloured specie. Further down the road we came across two more species growing side by side on the bole of a tree. They were *Polystictus cinnabarina* and *Schizophyllum commune.* Far below were quiet glades inviting our exploration, but time prohibited that; beside us were massive sandstones suggestive of strength; before us was our goal—Lugarno Ferry. A sharp turn in the road and we got our first glimpses of the water, and a little way beyond was our objective.

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*See Proc. Linn. Soc. N.S.W. (1901) 145.

We now surveyed another phase of Nature's handiwork. The rippling water, the sun shedding its last rays of light, the ferryman's home jutting out into the river, and the dark shadows all impressed themselves on us. On the farther shore a gum covered mountain rises sharply, and nestling at its feet are many little homes "Away from the maddening crowd." The ferry, too, was on that shore awaiting its next passenger.

With regret we turned our footsteps back as the shadows had begun to fall. As we climbed the mountain we saw the scene from a new aspect. We heard, too, our feathered friends singing their last refrains. The minor tones of the Spinebill Honey-eaters, *Acanthorhynchus tenuirostris,* as they hurried home; the last chants of the yellow Robin, *Eopsaltria Australis;* and the beautiful mellow tones of the Gray Shrike Thrush, *Colluricincla harmonica,* resounded through the bush. The sweet little Diamond bird, *Pardalotus punctatus,* let us know its presence, and the yellow-tufted Honey-eater, *Ptilotis melanops* allowed us to pass quite close to it.

The scene on the top of the mountain is mirrored in my mental vision. The tall black butts growing up as straight as a die for forty or more feet before they send out their branches; their black boles standing out in relief; their foliage forming a canopy; their very selves a shelter for the shrubs, flowers and wee things which thrived at their feet. Through this timber away to the west the winter sun was setting, and saying its last good night for another day. Splashes of golden yellow against the surrounding grey clouds cast a spell over all the scene. Just in the foreground were our naturalists having billy tea and sandwiches.

The shadows fell quickly, a moist chilliness was felt in the air, and we were soon to know its meaning. The clouds became tired of holding their moisture so they thought they would drop it on us—much to our discomfort!

Was a 'bus ever so long in coming? We watched the road for an oncoming light; we watched in vain. Meanwhile we tried to get some scanty shelter from an overhanging tree until quick ears heard the 'bus coming out of the darkness. It was dark, too, and matched its surroundings. Somehow we scrambled in feeling our way, for lights in these parts are an unknown quantity. Packed tightly we travelled along the road to Hurstville Station in this dark hole, seeing nothing, but feeling much. Occasionally we stopped to pick up more passengers until not another one could be taken on. In spite of the inconvenience of the ride we were very thankful that we were not trudging along the road in the rain and darkness.

Hurstville found us a happy band of naturalists comparing notes, and our collection of spoils, but we were minus our leader, Mr. Cheel, who left the 'bus at Penshurst.

The following list of flowers, fruits, trees, lichens and fungi were collected or identified during our excursion:—

In flower.—Acacia longifolia, A. suaveolens, A. discolor, A. linifolia, A. juniperina, Pimelia linifolia, Epacris pulchella, E. longiflora, E. longiflora var. alba, Styphelia laeta, S. tubiflora, Leucopogon setiger, L. juniperina, Astroloma humifusum, Lissanthe strigosa, Grevillea mucronulata, G. sericea, Banksia spinulosa, Bossiaea heterophylla, Hibbertia Billardiera, H. diffusa, Casuarina suberosa, Caladenia alba, Correa speciosa var. viridis, Loranthus pendulus, Rapanea variabilis or Myrsine variable, Notothixos incanus, Omphacomeria acerba.

Fruit.—Hakea dactyloides, H. acicularis, Exocarpus cupressiformis, Leptomeria acida, Bursaria spinosa, Smilax glycyphylla, Acacia falcata.

Trees.—Brachychiton populneus or Sterculia diversifolia, Syncarpia laurifolia, Angophora lanceolatus, Eucalyptus longifolia, E. haemostoma, E. corymbosa, E. piperita, E. pilularis.

Lichens.—Ramalina yemenesis, an Hepatic, Stictina Mougeotina var. xantholoma.

Fungi.—Polyporus ochroleuca, Polystictus cinnabarina, Schizophyllum commune.

HILDA M. CRISPO.

EXCURSION TO ENGADINE.

On September 14th a whole day excursion was held to Engadine, under the able leadership of Mr. E. Cheel. The party, which comprised some 30 members, and several visitors—left Sydney by the 8.20 a.m. train, and proceeded from Engadine Station towards the Woronora River—a walk of about 2½ miles. The level country above the gully yielded interesting specimens of a low shrubby vegetation. Many of these plants are xerophytes, and show excellent adaptation to the dry exposed conditions under which they live, chiefly by reducing transpiration by the thickening of the cuticle, the sinking of the stomata of the leaves, by exposing the least possible surface to the direct rays of the sun, and by many other methods, thereby enabling the plant to thrive with less loss of water than under normal conditions.

Amongst the bushes were found numerous specimens of that beautiful little Lady's Slipper, *Hybanthus filiforme.* Taking a track down into the gully, a taller and more luxuriant growth was found, amongst which towered the beautiful giant lily, *Doryanthes excelsa,* just in flower. Here, too, was found *Mirbelia speciosa,* not before recorded for this district. On the bank of the river a delightful spot for camping was found, and the energies of the collectors were now confined to the margin of the river and to the hill across the other side. Growing amongst and between the rocks, close to the river were found several bushes of *Pseudanthus pimeleoides,*—a most beautiful shrub, and several other very interesting plants. Growing on the bare, exposed slope, across the river, several species of terrestrial orchids were collected. These took careful searching, on account of their small size, and the comparatively rare occurrence of some of them. However, during the afternoon, quite a large number was collected.

The following is a fairly complete list of the flowering plants collected during the day:—

Pseudanthus pimeleoides. Daviesia latifolia, Mirbelia speciosa, Dillwynia ericifolia, D. floribunda, Phylotta phylicoides, Pultenea flexilis, P. stipularis, Gompholobium grandiflorum, G. minus, Bossiaea scolopendria, Acianthus caudatus, A. fornicatus (in fruit), Crytostylis reniformis, Caladenia tesselata, C. alba, C. coerulea, Dendrobium linguiforme, Lyperanthus sauveolens, Thelymitra ixioides, T. carnea (in bud), Prasophyllum elatum, Pterostylis nutans, Diurus maculata (also fruit), Glossodia major, G. minor, Grevillea asplenifolia, G. sphacelata, G. oleoides, Conospermum planifolium, Hakea saligna var. angustifolia, Isopogon anemonifolius, Petrophila pulchella, Banksia marginata. Lomatia longifolia, Persoonia lanceolata (in fruit), P. pinifolia (fruit), Comesperma ericinum, Sprengelia incarnata, Epacris microphylla, E. obtusifolia, Styphelia setigera, L. lanceolatus, Hybanthus filiforme, Tecoma australis, Pomaderris elliptica, Pomaderris phillyraeoides. Westringia eremicola, Lasiopetalum rufum, Actinotus minor, Xanthosia pilosa, Amperea spartioides, Bertya pomaderdoides, Ricinocarpus pinifolius, Aster ramulosa, Baeckia diffusa, Calycothrix tetragona, Bauera rubioides, Callicoma serratifolia, Phebalium dentatum, P. squamulosum, Boronia ledifolia, Philotheca australis, Zieria Smithii, Burchardia umbellata. Xerotes Brownii, X. longifolia, Doryanthes excelsa, Cassytha glabella, Casuarina Cunninghamii, Dampiera stricta, D. Brownii. Dodonea triquetra. Drosera peltata, Logania floribunda, Loranthus celastroides, Triglochin procera, Callitris Muelleri, Poranthera ericifolia.

Miss McAnene brought a number of her young pupils with her, who, hidden amongst the trees, delighted us with bird calls at intervals during the day. We were honoured by the presence of a distinguished visitor, Dr. W. D. van Leeumen, who made a fine collection of Australian flowers to take back with him to Java.

Returning to the railway station, Mr. Watson proposed a hearty vote of thanks to Mr. Cheel, who, despite pressure of work, kindly acted as leader of this delightful excursion. This was carried by acclamation.

THISTLE HARRIS.

INTELLIGENCE IN SERPULA WORM.

At the March meeting Mr. David G. Stead related an interesting experiment carried out at Watson's Bay, which indicated not only that the common Serpula Tube-worm of the littoral was highly sensitive to light, but that it was capable of rapid and intelligent observation in certain directions.

In a recently formed marine aquarium—a tank of about 1.75 cubic feet capacity—an embryo Serpula had established itself; the tube growing to about 42 mm. in a period of not more than 35 days. After a great sensibility to light had been definitely established, the experiment was tried, of suddenly intercepting the main light source, with the hand. Instantaneously, the worm darted back into its tube. After a moment it reappeared; when the hand again intercepted the light—with like result. This was repeated eight times, when it was observed that the worm's "head" was not withdrawn so far, and the reappearance was more rapid. At the twelfth test the worm was unaffected by the occultation of light, and remained with the antennae fully spread out. After a lapse of half an hour the experiments were repeated. On this occasion the worm had lost memory of the non-harmfulness of the interference with the light, and quickly retreated—repeating the performance till the eleventh pass of the hand; when it again became callous to the hand movement. In each case, after the worm had become "calloused"—or where its intelligent observation and vestigial memory had indicated to it that the light interference was not harmful—no amount of rapid or slow movement of the hand or body of the observer, had the slightest effect upon the worm; which remained in the normal "expanded" attitude. Further experiments would be made.

PLANT LIFE UNDER PAST CLIMATIC CONDITIONS.

In his lecture at the November meeting, Mr. Barnard outlined in a most interesting manner the various geological ages, and, by the aid of a chart loaned by the Botany School, made the successions of plant life very clear, beginning with the pre-Cambrian times when there were only indefinite traces of life. He showed how the great ice ages had influenced the flora. The earliest signs of plant life occur in the Silurian and consist of remains of sea weeds. The great Carboniferous age was illustrated with slides of fossils and of reconstructed plants. The coming of Angiosperms was shown, and the gradual increase of this type of plant, while other types dwindled and died out. Australia, he said, had been a distinct continent for a long period of time, joined in Permian times to Tasmania and Antarctica, and round to South America, also with Asia to form Goodwana Land. The surface of the land has greatly changed, the present Great Divide was formerly occupied by a low divide, and the courses of the rivers were different. All these factors were stressed as bearing on past and present flora of our country. The flora of Australia was compared, and contrasted with that of other lands.

NOTES AND COMMENTS.

Embiidae. At the October meeting, Mr. Gallard read a note on a colony of these interesting insects, as follows:—Under a soft-barked tree at Epping on September 13th I found a winged Embiid and on further search in a mass of the white webbing secured about 18 fine specimens mostly of the early wingless stage. After about three weeks in captivity, feeding them on sugar, six of them developed wing pads and ultimately matured into perfect winged adults. They spun a mass of white web in the bottle in which they were confined, well ramified with tunnels. During the day their heads could be seen at the openings, but on being disturbed they retreated out of sight. The nest was about 1½ inches square. One female laid a few small brown oval shaped eggs. A few weeks later a peculiar wingless Proctotrypid like wasp emerged. In appearance and action it resembled the Embiidae, and I presume it to be parasitic.

Lugarno Ferry. A melancholy interest attaches to the report on the excursion to Lugarno Ferry, it being the last contribution of our gifted member, Miss Hilda M. Crispo, prior to her death.

Erratum. January, 1924, p. 155. Pennant Hills Gully, for 1892 read 1922.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

ORDINARY MEETINGS.

March 3rd.—Mr. E. Cheel, President, in the chair, and a good attendance. Misses A. Fuller, E. Butler and D. Carmody were duly elected members.

Mr. Stead (Hon. Organiser), spoke on the exhibition to be held in the Gallery—as last year—from October 8th to 15th, and asked members to make the exhibition worthy of the Society.

Mr. A. P. Mackerras then gave a most interesting lecture on Astronomy, illustrated with lantern slides. He dealt with the Solar system mainly, touching on comets and nebulae, as well as theories on the formation of satellites, systems, etc.

Exhibits, Miss McAnene, *Phyllanthus angulata,* whose fruits, though acrid, make an excellent preserve. Miss H. Butler, B.Sc., Marigold (*Calendula*), exhibiting remarkable chloranthy. Mr. A. A. Hamilton, real and false Dandelion (*Hypochaeris* and *Taraxacum*). Mr. Froggatt, the pupal nest of two large Curculionid beetles, which attack the Hoop pine (*Araucaria Cunninghami*) with notes.

Mr. D. G. Stead, a note on the common *Serpula.* Miss E. Segal, Ginseng from Korea, a plant credited with the power of renewing youth.

April 1st.—The President, Mr. E. Cheel, in the chair, and a good attendance. Miss Batty was duly elected to membership.

The Hon. Secretary spoke of the valuable gift conferred on the Society by Mr. J. H. Maiden, then original Ms. of Rev. Dr. Woolls "Plants of N. S. Wales," which had been given to Mr. Maiden by Mrs. Woolls some years ago.

A paper on "Mimicry," by Dr. Chisholm, was read. Mr. Froggatt contributed an interesting note on "Pioneer Naturalists."

Mr. Gallard, *Opius Tryoni,* parasitic on the Queensland fruit fly; also *Papilio anatres,* larva, chrysalis and imago. Mr. Cheel gave an account of Ginseng (*Panax*), which was exhibited at last meeting; also exhibiting a very fine living specimen of the fruiting stage of *Polypora mylittae;* he also drew attention to the so-called variety *Melaleuca erubescens,* which should perhaps be a distinct species instead of a var. of *M. ericifolia.*

Miss Harris, *Marsilea* (Nardoo), with fructification, Miss Winter, Kitten of Native Cat (*Dasyurus viverrinus*), which is still quite common round the head of the gully between North Sydney and Neutral Bay.

GINSENG.

By A. I. Karlin.

Except Formosan camphor there is probably no other product that yields the Japanese Government such profit as the cultivation of this root in Korea. Americans, ever keen on capturing a new trade, have made various experiments to grow it, but the results have been unsatisfactory, as for one reason or another ginseng only thrives well on Korean soil. The most extensive fields are about two hours from Seoul (Koijo), the capital, and shade plants must protect the growing roots, which take from three to four or more years before reaching maturity, the best roots being those whose growth is slowest. The plantation and all the export is a State monopoly, and not one root is allowed to slip by, each, after having been dried and carefully cleaned being supplied with a kind of "necktie," giving its quality and number in Japanese characters. The roots are then packed in small boxes, and the box sealed, and only sold by chemists, their weight being paid for in gold. The average yearly profit amounts to 20 million yen, and all the produced ginseng goes to China, as the Chinese consider it one of the most powerful medicines, and ascribe the root that looks a little like a small crippled man the power of making an old man young again, a most important fact in a country where all diet and all the modes of life are ruled by sex instinct. It is, as I found out myself, undoubtedly true that even a small cup of this tea has a wonderfully stimulating effect, and makes one endure hardships easily, but it is said that an extensive use finally leads to madness.

Wild roots up in the mountains are nowadays exceedingly rare, but sometimes a Korean Rip Van Winkle will disappear in some gorge where he happened to discover such a root, and will build his hut next to it, watching it patiently until it finally is matured. Then he takes it to the Government office or smuggles it into China directly, and his reward will be a thousand yen, and if the root is an exceptionally old one (20 years), even more, for there are no limits to the youth-giving power of such a wonderful ginseng, according to Chinese ideas.

NOTES ON A "CORAL LICHEN" (CLADONIA RETEPORA).

By Edwin Cheel.

One of the most interesting species of the Australian lichens is a plant having a coralline appearance which has gained for it the appropriate vernacular name of "Coral Moss." It is not a true moss, but belongs to the Lichenes group of the vegetable kingdom. It was originally collected in Tasmania and recorded by Labillardiere (38) under the name *Baeomyces reteporus,* where it is described and beautifully illustrated. Like many other species of our lichenological flora, it has several aliases, and is recorded under the following names:—*Cenomyce retipora* Ach., (101) *Clathrina retipora* Mull.-Arg., (94) *Cladina retipora* Nyl. and *Cladonia retipora* Spreng. (40). It is certainly not a true *Baeomyces,* and as Acharius, genus *Cenomyces* is inappropriate, it was placed in its proper genus by Sprengel. Dr. Jean Müller (Müll.-Arg.) of Geneva, established a new genus *Clathrina,* in which the species under discussion together with *C. aggregata* and others were placed. Modern lichenologists are inclined to regard this genus as a mere section of the genus *Cladonia,* so I have accordingly followed Sprengel in placing it in this genus. Several of the earlier collectors, including R. Brown, R. C. Gunn and Mr. Ince collected it in Tasmania, and D'Urville and W. Colenso also collected it in New Zealand. All the above collections are represented in the British Museum and at the Royal Herbarium, Kew, England. The Rev. W. Woolls (4) was much impressed with the beauty of this coralline plant, for we find the following statement concerning it.—"The most interesting lichen that I have seen in Australia is *C. retipora,* but it does not occur in this (Parramatta) neighbourhood. The Rev. T. Hassall gave me a specimen of it, which he procured from the vicinity of Berrima, and the accomplished authoress of 'Gertrude' and 'Cowanda' informs me that she has had specimens from the same locality, but as the species was described by Sprengel many years since, I think that it must occur somewhere nearer the coast. It grows to the height of several inches, and the upper surface is granulate. The podetia are erect, tubularly ventricose, pierced with numerous small apertures, of a sulphury brown colour, branched, and having small black apothecia. As it becomes old, it assumes somewhat a coralline appearance, becoming nearly white. My learned friend, Dr. F. Mueller, informs me that *C. retipora* is common in the glacial regions of Tasmania and New Zealand." On page 11 of the same work Woolls also refers to it as follows:—"It is highly probable that our Cladoniae of which we have also the elegant *C. retipora,* contains a certain quantity of gummy and starchy matter, and hence they might be used in hooping cough and other complaints of the lungs, but it would be difficult to procure them in any quantity." Since the publication of Woolls' work (1867), there have been many collections of this species made, chiefly in Tasmania and New Zealand, all of which confirm the statement made by Mueller, that it is common in the glacial regions. In a letter to me dated 9th October, 1912, Mr. J. W. Audas, in sending me specimens states that "it grows in abundance at the Grampians (Victoria), and often occupies large patches on the sandstone ridges, but I have not noticed it growing anywhere else in Victoria." It would appear from the above statement, together with the remarks made by the late Rev. Dr. Woolls, that the plant is comparatively rare, but this is not so, as we find it recorded in no less than 28 works, and the collections which have accumulated in the National Herbarium, Sydney, and now properly organized in their proper botanical sequence, show that this remarkable lichen had a very wide range in distribution, being represented in many localities in every State in the Commonwealth, as well as being plentiful in New Zealand and New Caledonia. To give an idea of the exact distribution, as shown by an examination of specimens seen by me in the Royal Herbarium, Kew, British Museum and National Herbarium, Sydney, I have drawn up a list of the actual localities together with a reference to the numerous works in which the species has been recorded, as follows:—

See Cheel's "Bibliography of Australian Lichens" in Proc. Roy. Soc. N.S.W., xxxvii. (1903), 172 and xl. (1906), 41, opposite the following numerals, 3, 4, 6, 8, 11, 17, 38, 41, 42, 49, 57, 64, 85, 94, 101, 103, 119, 127, 145, 147, 148.

Reprints of the above Bibliography, are in the Naturalists'

Society's Library and the works referred to may be consulted in the public library.

Additional works consulted since the Bibliography was published are as follows:—

Cheel, E., in Annual Reports of the Botanic Garden, Sydney (1913), 16, and The Australian Naturalist, v., p. 85 (1923).

Cunningham, A., in Hooker's Comp. Bot. Mag., ii., p. 232.

Bailey, F. M.—Comprehensive Catalogue of Queensland Plants (1912), fig. 695, p. 684.

Smith, A. L.—Journ. Linn. Soc. (Bot.), xlvi. (1922), 75.

Nylander, W.—Recogn. Ramal., p. 69.

List of specific localities:—

N.S.W.—Mosman, W. W. Froggatt, April, 1892; Spit Road, J. H. Camfield; Balgowlah, Manly Heights, E. Cheel; Five Dock, E. Cheel, 3-1917; Richmond, J. J. Fletcher and C. T. Musson, 9-1906; Nattai River, via Hill Top, E. Cheel; Berrima, P. E. B. Barnett; Kangaroo Valley, D. McDonald; Braidwood District, 3,200 ft., W. Bauerlen, November, 1886; Milton, W. Bauerlen, Specimen in Melbourne Herb.; Barbers Creek, J. H. Maiden, 14-9-99; Blue Mountains, Haviland, 1892; Ross Cave, Mt. Victoria, A.G.H. (20), 30-6-81; Mt. Wilson, J. Gregson, 3-6-04; Old Man Point, Canoblas, T. H. Johnstone, 4-1908; Gulgong, J. H. Maiden and J. L. Boorman, 4-1901; *Wyalong, J. L. Boorman; Brogheda, W. Craigie, Raymond Terrace, M. J. Campbell; Richmond River (Vide Krplh); Tenterfield, No. 2802, July, 1901; Torrington, J. L. Boorman; Warrumbungle Ranges, W. Forsyth, 10-1901.

Queensland.—Maroochie, Severn River, Rockhampton, C. Hartmann (15).

Victoria.—Mt. Ellery, Gippsland, C. Walter; Gippsland, C. Walter, 1887; Sources of Blackwood River, Miss Cronin, 1889; Bendigo, Miss F. Campbell; Beechworth, Wils, No. 181; Gippsland, Miss Flora Campbell; Mt. Macedon, R. A. Bastow; Oakleigh, Wilson; Mt. William, 1,000-1,500 ft.; Appollo Bay, C. Walter; Ballarat, D. W. Spence; Mount Grampian, D. Sullivan, No. 10.

South Australia.—Kangaroo Island, Professor Tate; Israelite Bay, Miss S. Brooke, 1887.

West Australia.—Perth, T. Steel; Uberin Hill, Dowerin; C. A. Fountleroy, 3-6-09; Karolin, R. Helms; December, 1891; Mt. Melville, J. Campbell.

S.W. Australia.—Kent River (Granite Rock Mountain), S. W. Jackson.

Tasmania.—(Van Diemens Land), Labillardiere, R. C. Gunn; J. Carrol, 1874; Dr. Harvey and Mr. Ince (in British Museum) Clarke Islands, Mclaine; Mountain Heaths, R. Brown (1802-5), Nos. 533, 534, Fowlers Bay; Karolin and King Island, F. von Mueller; King Island, E. Spong, 1882; King Island, McQuarries Head, R. C. Gunn; Knocklofty, R. A. Bastow; Mt. Zeehan, W. V. Fitzgerald; St. Patricks River, R. C. Gunn, 16-11-1844; near Georgetown, Western Mountains, W. H. Archer; Quamby's Bluff, W. H. Archer; Port Davey, Rev. J. Bufton, 1893; Macquarie Harbour, Mr. Atkins; Circular Head, S. Emmett; Ulverston, Rev. F. R. M. Wilson; Port Esperance to Southport, D. Purvis; Geeveston, A. H. S. Lucas; Mount Wellington, A. H. S. Lucas.

New Zealand.—Waiora Valley, W. Gardener; Whakarewarewa, Rotorua, E. Cheel; Lake Manopouri, J. Hawkins Smith; Hot Springs, Wairakei, W. Benson; Wangari Valley, S. Mossman (1850), No. 793.

*The Wyalong specimen approaches the *forma Sullivani* Müll.-Arg., collected on the Grampians in Victoria by Mr. D. Sullivan.

PIONEER NATURALISTS.

By W. W. Froggatt.

When I was a small boy about the year 1868, my father and some of his friends in Bendigo, where we were all interested in mining, used to look forward to the open season for game early in January, and used to pack up a week's supply of food, drinkables and horse feed, and with kangaroo dogs, a retriever, and a bountiful supply of ammunition make over the plains of northern Victoria to the Murray Swamps, in those days the home of all kinds of ducks and wild fowl. On the park-like forest of the Terrick and Mount Hope Ranges and the open plains roamed mobs of kangaroos and families of emus, and the great plain turkey or bustard.

In those days the land was all open with fences few and far between, usually about twelve miles apart. It was not till 1873 that the free selectors trecked up from the southern country, and the reign of the squatter ended.

All of us boys were naturally keen sportsmen, and it was one of the greatest treats to be taken with our elders on one of these shooting trips of 60 or 70 miles drive and back and we cheerfully did all the washing up, helped to feed the horses, tie up the dogs, and make ourselves generally useful.

Books on Australian Natural History were unknown to us, and when one day my father bought me "Bush Wanderings of a Naturalist," by An Old Bushman, I read every word of it, and decided I also would be a bushman.

"The Bush Wanderings of a Naturalist, or notes on the Field Sports and Fauna of Australia Felix," was the full title of the book, and it was published in London in 1861. A second edition, enriched with pictures copied from Gould was published later; both are now rather rare books.

The author of the first authentic and popular description of Australian bush life was Horace William Wheelright, who was born at Tansor, Northamptonshire, on January 5th, 1815, and after all his wanderings died in his native land on November 16th, 1865.

His father was the Rector of Tansor. He studied for the law and practised as a solicitor between 1843 and 1847, but the wanderlust took him, and he spent some years among the lakes and mountains of Norway and Sweden. In 1851 the discovery of gold in Victoria attracted the wanderers of the world to Australia, and Wheelright was among them.

He did not make good on the goldfields, so turned hunter and shot ducks, other game and kangaroos for sale. The story of this part of his life is told in his Bush Naturalist, and the last article in his last work entitled, "The Australian Bush."

In 1856 he returned to Europe and again set out for Sweden, and took up his residence at Gardsjo, near Carlstadt, where he devoted his time to the study of Natural History and shooting, and this part of his life is told in his book, "Ten Years in Sweden."

In 1860 he commenced writing for the "Field" newspaper, and these articles were published in book form by Frederick Warne & Co., in 1865, "Sporting Sketches at Home and Abroad." In the last two sketches are also Australian experiences, "The Wreck and the Australian Bush."

NOTES ON OPIUS TRYONI.

By L. Gallard.

On February 10, while doing some collecting in the Gosford district, came across a White Ash tree (*Schizomeria ovata*), which had cast a lot of its berries. I opened some and found they were infected with fruit fly. I then collected about a quart of berries, and brought them home to breed out, with the object of testing whether the red parasitic wasp that we bred from them at the Government Insectarium at Narara in 1910 was still holding its own. On February 28th, 6 Queensland flies emerged, and between that and March 2nd 25 more Queensland flies and 12 red parasitic wasps emerged, making a total of 31 Queensland flies, and 12 parasitic wasps. Possibly the flies have nearly all developed, but I hope to still get a few more parasites. This wasp was figured and described by Mr. Gurney, our present Government Entomologist in his report of the work done at Narara in connection with the Insectarium between 1908 and 1911, and a full description of it can be seen in his Bulletin, No. 55, November, 1915, entitled "Fruit Flies and other Insects attacking Cultivated and Wild Fruits in New South Wales."

This small wasp, by the aid of its long ovipositor, punctures, and lays an egg in the fly maggots in much the same way as the fly does a peach. The young larvae, when hatched, feed internally on the larvae of the fly, leaving the vital organs till last, to enable the work of pupation to go on sufficiently to provide a pupal shell, which in turn serves as a pupal covering for them. Nothing can be seen of the working of the parasite from the time the egg is laid till the adult emerges from what appears to be a normal fly pupa. I have put a few of the adult wasps away with a quantity of fly larvae to see if I can rear some artificially. On account of pressure of business at the February meeting, this exhibit was held over.

Since that 5 more Queensland flies have emerged, and 2 more parasitic wasps, making the totals: Queensland flies 36, parasitic wasps 14.

MIMICRY.

By E. C. Chisholm, M.B., Ch.M., R.A.O.U.

In the great struggle for existence going on in the animal world many expedients are adopted for protection. Nature has endowed many forms with special apparatus for self-defence. We may divide these into active and passive methods; as an example of the former, we may take the stings of insects, the poisonous spines of fish and the venom apparatus of snakes. The passive method may be divided into two types: in one of which the animal relies on its hard protective covering for its defence, as in the case of crabs, tortoises and turtles, the spines of *Echidna* and the armour of the Armadillo. In the event of being attacked, these animals offer a more or less passive resistance. In the second type, viz.: mimicry, the animal relies for its protection on its resemblance to nearby natural objects to defy detection, but once this is overcome the animal falls an easy prey. Mimicry is the form of protection we are dealing with here. Nature has provided the Animal Kingdom with examples of this from the lower organisms to the highest; we see it in various grades of development, and it is undoubtedly one of the most efficient means of protection. Starting from the insects we see it well illustrated in the stick and leaf insects; these *Orthoptera* are found on plants much the colour of themselves, and the attitude assumed gives them a very real resemblance to the plants on which they live. We have very good examples of these in New South Wales.

In the *Lepidoptera* we see it very well developed, both in the larval stage and the adult. The looper caterpillar assumes an attitude in which the hind pair of claspers alone are grasping the twig, the body being held out rigid at varying angles minutely, resembling a twig, and is sometimes difficult to detect even by trained eyes. The moths of these caterpillars, too, have a mottled pattern, and when assuming their characteristic attitude with wings spread flat and resting on the surface of bark just the colour of themselves almost defy detection. In butterflies one sees it especially well marked; one of the most perfect examples I know of is that of the Indian leaf butterfly where the tails of the wings when closed rest against the stem of the plant looking just like a leaf stalk. We have many examples of mimicry in butterflies in New South Wales, e.g., *Doleschallia, Melanitis leda, Heteronympha merope, Xenica kluggi* and *X. acantha* to mention only a few. The wings of these butterflies are brightly coloured above, but when the insect alights and closes its wings vertically over its back, it resembles very closely its surroundings in the shape of dead leaves on the ground.

Ascending in the scale to vertebrates we see mimicry well developed in fish. A certain salt water fish about our shores called *Antennarius nummifer* is fashioned by Nature in such a way that it closely resembles the seaweeds among which it lies concealed, but in this case, besides affording protection from its enemies, it has another purpose to fulfil, namely, to attract smaller fry on which it feeds without giving signs of its presence. The inside of the mouth, which it keeps open, is coloured in almost exact representation of its surroundings. Now comes into play a special apparatus by means of which it greatly increases its chance of getting food, and this is in the form of a stalked appendage attached to the front of its head bearing at its free end a fimbriated fleshy knob which it proceeds to wave about just above its mouth; small marine animals such as shrimps are attracted to this bait, and entering its mouth are swallowed. This is the Angler Fish. Another good example of mimicry in fish is that of a fresh water form of the Gudgeon family, viz.: *Krefftius australis,* the striped gudgeon common in the Nepean River. This fish will lie on a rock the colour of itself perfectly motionless, and almost indistinguishable from its surroundings. Amongst the frogs is *Hyla caerulea,* a tree frog, sitting amongst the leaves of bushes much the colour of itself. The *Ophidia* or snakes give us some good examples, *Acanthophis antarctica,* the death-adder being one of the best, its colour resembling that of a dead stick or the colour of the soil on which it lies. The common dragon, *Amphibolurus muricatus,* is an excellent type amongst the lizards. It is frequently seen in gardens, and one of its characteristic situations is on a fallen log, the grey colour of which blends with its own, rendering it almost indistinguishable.

Of the birds, the most perfect example I know of is that of the Morepork, *Podargus strigoides.* The general appearance of its plumage being likened to grey bark or a dead limb, and to make the resemblance more complete when danger threatens, it erects its body to an acute angle with the branch on which its rests, and shuts its eyes to just mere slits, when it presents an almost perfect resemblance to a broken-off limb, the tuft of feathers in front of the bill adding considerably to the likeness.

EXCURSION TO EDWARDS' BEACH.

On Saturday, February 9th, an excursion was held to Edwards' Beach to study seashore life, under the able leadership of Miss Rose Winter. Miss Winter took the party round on to the rock platform, where rock pools were searched. The tide was too high to permit of very much collecting, but during the afternoon the following specimens were obtained, about each of which Miss Winter gave a short, interesting description.

Mollusca, about high tide level were found a number of collections of the tiny blue periwinkle, *Melaraphe.* This is a most interesting species, as it is a transition form, possessing organs for a marine life, but at the same time being possessed of respiratory organs of a typical land form. Between the rocks further down were particularly noted the white armoured shell *Thais*, the blackcrow, *Nerita*, and the common periwinkle, the showy *Triton* and many others. The rock-pools at a lower level yielded:—*Galeolana*, the gregarious annelid, which here "white-washes" the rocks. Portions of this were broken off, and the branchiae were examined. From the side of a rock-pool three very beautiful specimens of the tube-infesting polychaete, *Spirographis australiensis*, were examined.

Sea-anemones, *Paradis* (sea-waratah) *Oulactis* (sea dahlia), and other species were seen, and a specimen of the ascidian (*Boltenia australis*) was found. Other specimens included the eight-rayed starfish, *Astenna calcar*, the five-rayed form, *A. exigua*, the sprawling starfish, *Coscinasterina* sp., the dark-sea urchin with thick spine, *Toxocidaris* sp. and the common sessile barnacles, *Tetrachta* and *Chthamalus*, and several species of crabs.

The tide was unfavourable for the collection of seaweeds, but the following species were examined:—

Amongst the green weeds *Ulva lactuca* (the sea lettuce) *Euteromorph* sp., and a very interesting form of *Caulerpa*, which appears to grow from a rhizome which attaches itself to rock or sand and acts as a holdfast. Of the brown weeds, *Hormosira Banksii* (the head seaweed) was found in abundance, also a kelp *Ecklonia* sp., and of the red weeds several species of *Laurentia*.

On the hill a few flowering plants were collected, namely, *Irachymene linearis, Dipodium punctatum*, the snake orchid, a species of *Goodenia, Westringia rosmariniformis*, the coast rosemary, and *Epacris microphylla*.

Although there were only about fifteen members present, the excursion was an altogether interesting and successful one.

THISTLE Y. HARRIS.

NOTES AND COMMENTS.

At the April meeting, Mr. Cheel exhibited specimens of *Burmannia disticha*. It is chiefly found in the northern parts of the State, at Port Stephens, Byron Bay, Deepwater and Tweed River, extending into Queensland, Malay Archipelago and East India. He also exhibited fruiting specimens of the so-called Blackfellow's Bread (*Polyporus mylittae*). The spore-bearing pileus were well developed, of a whitish colour, with zones of egg-yellow colour.

At the April meeting, Mr. Froggatt exhibited the pupal nests of two large curculonid beetles attacking the Hoop Pine (*Araucaria Cunninghami*):—*Eurhamphus fasciculatus* lays its egg on the bark of the dead pine tree; the larva eating out a circular hole in the sapwood, beyond which it forms an oval cavity after plugging up the outer opening with torn strips of wood. In this oval cavity it pupates facing the opening, and looking like a Japanese doll. It emerges as a beetle in the middle of December. *Aesioles notabilis.*—These beetles lay their eggs on the edge of a crack in the bark of a dead Hoop pine where the bark is slightly raised from the trunk. The larva eat out an elongate chamber in the wood and, before pupating, tear up a quantity of wood into fine strips with which they form a matted mass or cocoon above and around the resting pupa. The adult beetles were emerging in the middle of December.

Spiculoea (*Drakaea*) *irritabalis.*—At the May meeting, Mr. A. Forster exhibited the above orchid, sent to him by Rev. H. M. R. Rupp, and contributed note as under:—I understand that this orchid was supposed to have no leaves, or, at any rate, that leaves were absent during its flowering season. A specimen which I found at Dee Why did not have any leaves. Mr. Rupp maintains that the orchid has flowers and leaves at the same time, and the specimen in hand confirms his contention. There is the usual flower bearing stem coming out of the bulb and two radical leaves also coming out of the same bulb, but they do not surround the flower stem nor are attached to it. They appear to have no further connection with the flower stem, except that they grow from the same bulb. I show also 2 sets of 4 and 5 leaves of the same plant, received from Mr. Rupp.

The Australian Naturalist

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

ORDINARY MEETINGS.

May 6th.—Mr. A. A. Hamilton (Vice-President), in the chair, and a good attendance.

Mrs. Clack was elected to membership.

Dr. G. A. Waterhouse gave a most interesting lecture on his visit to the Great Barrier Reef with the committee, on which he represents the Naturalists' Society. He detailed the history of the Reef, what had been done there in previous years, and what it was now proposed to do. The object of the committee was to study the Barrier Reef, its structure and formation, possible uses to Australia, importance to shipping, and the like. The important work which Mr. C. Hedley had done was also emphasised.

June 3rd.—The President (Mr. E. Cheel), in the chair, and a fair attendance.

Rev. H. M. R. Rupp was duly elected to membership. The President read a paper by Rev. Mr. Rupp on "Orchids of Bullabeela District," adding valuable comments on the habits and classification.

The President explained what was being done to secure a permanent camp at National Park, so as to enable a complete biological survey being carried out.

Mr. Watson exhibited a plant from the interior, *Pittosporum phyllicoides,* in fruit. Mr. Scammel specimens of *Chiloglottis diphylla* to show variation in length of flowering stem, also fresh examples of *Hakea laurina,* native of W. Australia. The remainder of the evening was devoted to the examination of very fine paintings by Mr. Forster of orchids obtained from Rev. Mr. Rupp.

July 1st.—The President (Mr. E. Cheel), in the chair, and a fair attendance. At her special request, Miss Brewster was re-elected to membership, she having previously resigned owing to extreme pressure of work.

Mr. Froggatt read most interesting notes on Miss Louisa Anne Meredith, a pioneer naturalist of the early days, and exhibited a number of her books on Australian and other Natural History.

Miss Butler had an interesting exhibit of Australian Pteridophyta, including Nardoo (*Marsilia Drummondi*), *Psilotum*, *Azolla*, *Lycopodium* and other club mosses.

Mr. Forster exhibited a branch of *Acacia suaveolens* from Berowra in which the plant had "thrown back" to the primitive leaf. The President, in reference to some remarks made before the Society about eighteen months ago, read a list of plants on which he could say definitely that manna was to be found. This comprised some 66 species (39 genera, 22 families). He also gave some interesting remarks on the formation of manna. The President then welcomed Mr. Cox, a member of the Victorian Naturalists' Society. Mr. Cox replied, expressing the pleasure it gave him to be present.

ONE OF OUR FIRST BUSH NATURALISTS.

By Walter W. Froggatt, F.L.S.

Louisa Anne Meredith, born 1812, England, arrived in New South Wales, 1839. Died in Tasmania, 1895. Bush naturalist, artist, writer, and poetess. Before she left England she had published "Our Wild Flowers" and "Romance of Nature."

During her long life she travelled a great deal in New South Wales, Tasmania, and Victoria, and took a keen interest in everything she saw in her travels. She wrote four books, which tell the history of her life up to 1861. The first, perhaps the most interesting to bush naturalists, is entitled "Notes and Sketches of New South Wales, during a residence in that colony from 1839 to 1844." (London, John Murray, 1844).

She dedicated it to "Those dear English friends for whose amusement and at whose request the following pages have been written."

The preface was written at Spring Vale, Swanport, Van Dieman's Land, 1843. She and her husband, Mr. Charles Meredith, left England early in June, 1839, and arrived in Sydney Cove September 27th, 1839. A quick passage considering the type of sailing vessels coming to Australia in those far away days. The first five chapters deal with the outward voyage and arrival in Sydney.

Her second Australian book was entitled, "My Home in Tasmania," during a residence of nine years. It was published in London in 1852, dedicated to Our Most Gracious and beloved Queen, and the preface was written at Riversdale, Great Swan Port, Van Dieman's Land, July 18th, 1850.

Her second voyage from Sydney to Hobart was much more eventful than her first from England, and the present inter-State traveller can have little idea of the pleasure of sea travel in 1844.

The sailing ship, "Sir George Arthur," was an old coal boat, that had been previously bringing coal from Newcastle, and Mrs. Meredith says, "dirty and covered with coal dust, and built as much as possible after the model of a brewer's vat." It was ten days before they sighted Point Pillar, and none of the lady passengers had come on deck until they passed that landmark.

This book gives a very interesting account of country life in Tasmania in those days, and is illustrated with seventeen wood-cuts, some of them illustrating the trees and animals of the district. Her notes, not only on the natural history, but the social conditions are well worth reading, and I can recommend these two volumes to all bush naturalists.

Mrs. Meredith's third publication, and the most important from the botanical point of view, is "Some of My Bush Friends in Tasmania," native flowers, berries and insects drawn from life, illustrated in verse, and brightly described. Published in London, 1860. This book is also dedicated to the Queen, and the preface was written at Twamley, Tasmania, August 6th, 1859. This book is much better known to Australian naturalists than the two earlier ones. It contains eleven full plate coloured lithographs of Tasmanian flowers with a few insects, and clusters of berries, other drawings illustrate the letterpress.

The fourth book issued by our old-time bush naturalist is an account of a holiday trip to Victoria, and is entitled "Over the Straits," a visit to Victoria, with illustrations from photographs, and the author's sketches. London, 1861. This book was written on her return to her home in Tasmania, and is dedicated to Sir William à Beckett, late Chief Justice of Victoria.

Mrs. Meredith was again very unfortunate in her third voyage from the mouth of the Tamor to Port Phillip, for the first night out they ran into a gale and were driven eastward past Wilson's Promontory, and did not reach Melbourne until five days later.

The greater part of this book is taken up with description of life on the goldfields, the manners of the Melbourne people, and cruelty to animals, but there are some interesting notes on bird, animal and insect life.

Among the first things she records are the flies and dust, and on her first drive to South Head she saw a number of parrots, notes the curious plants and admired a large flock of black cockatoos on a large dead gum tree.

She says: "I heard that there was a Museum of Natural History; and the 'Australian Library' contains an excellent selection of books for so young an institution." The latter portion of the book contains an account of their life at Homebush, then consisting of Homebush House, surrounded with teatree scrub, and her notes on natural history, among the latter is a very interesting account of the Cicadas, and the insect architecture of our case moths and a cup moth, illustrated with a plate of six cocoons.

NATURALISTS' SOCIETY OF N.S.W.

TEACHERS' COLLEGE BRANCH.

This little branch Society has made excellent progress since last year, and now numbers 66 members.

Two meetings were held during the term, the first on April 14, at 11 a.m., at the College, when Mr. A. H. Chisholm lectured on "Bird Life." The attendance was large, numbering 150 students and members of staff, who were greatly interested, not only in the details of Australian bird life, so ably described by the lecturer, but also in the very fine collection of lantern slides with which his remarks were illustrated.

The second lecture, in May, was by Mr. D. G. Stead, on "By Sea and Jungle in the Malay Peninsula." The people themselves were described, and much interesting information given on the fauna and flora, in which the lecturer was particularly well informed, and so made his remarks most instructive. The lecture was illustrated with many very fine lantern slides, and it was asked that Mr. Stead be invited to continue his lecture on a future occasion.

Only one excursion was held, to Earlwood, under the leadership of Mrs. Roach. Starting from Wardell Road tram stop, the party, of about 15, went in the direction of Hurlstone

Park, and met with very fair success in entomological and botanical collecting, particularly in the vicinity of Cook's River. The plants collected included five species of wattle, and a considerable number of the plants of the district were noted in flower.

THISTLE J. HARRIS,
J. F. BINGHAM.

METURA ELONGATA.

By MARY FULLER.

Some months ago I had two of the caterpillars of this case moth in a cage together. They fed on various kinds of leaves, including gum, ti-tree and camphor-laurel, but ate much less than other caterpillars. A few nibbles out of a couple of leaves in each fresh supply seemed to satisfy them.

After about three weeks, one of them died. Its case measured four and a half inches. Then, the other one, evidently finding its case growing too small, took the neck of the dead caterpillar's case and joined it to the neck of its own, making a large continuous case eight and a half inches long. Crawling straight through, the new inmate cast out the dead body of the former one through the end of his case, and widened it to form a neck. Both cases, as usual, were strengthened with lengths of stick, but where the join occurred, near the centre, there was no wood at all. The rather clumsy puckering of the silk at this spot was clearly noticeable. The larva in this elongated and grotesque-looking case continued to live for about a month in the cage, and then died without pupating.

I have never heard of such an instance before—the caterpillar usually enlarges his case in accordance with his growth—and I am inclined to regard it as rather phenomenal.

OBSERVATIONS ON THE PRAYING MANTIS.

By MARY FULLER.

About the middle of February, I secured a young mantis in the garden, and put it in a cage in order to watch its actions and methods of catching its prey. It was about one inch long, and in the second last stage of its development when I placed it in the cage. Wings were lacking, and the antennae were very short. It made several clumsy attempts to catch a fly which I put in the cage, and finally succeeded in doing so.

The mantis proceeded to eat the fly in the following way: Holding the fly firmly with its front legs, which are finely serrated, it first of all gnawed off the head, eating the eyes one at a time. Then it ate each leg separately, biting them off where they joined the body. Finally it ate the rest of the body, and cast away the wings. Each day I fed it with flies, but one seemed to constitute a large enough meal. The process of eating was always exactly the same. Sometimes it would capture a second fly and eat only the head, or the head and a couple of legs. It was always prepared for a meal in the morning and evening, but after catching two flies it would let the others walk all around it without taking any heed of them.

One evening I put five flies in the cage, and in the morning two were dead on the floor, whilst the other three had been eaten, as I could see by the wings. After an interval of an hour or two it would not refuse to capture a fly, but it would give it a few nibbles and then let it drop.

Its method of catching a fly was as follows:—Standing very still and with its front legs folded in the typical "praying" posture it would wait with its head upraised and eyes fixed on the prey. It would follow the movements of the fly by turning the head in any direction. When the unsuspecting victim approached near enough, with a sudden flash the mantis would throw out its legs and the fly was caught. As soon as the vibrations of the wings had ceased it would proceed to eat it. If a fly settled down on a certain spot, the mantis would stealthily approach until within the right distance and then seize it. After finishing a fly it would carefully clean away the tiny portions still impaled on the serrations of its front legs.

After about a week the mantis became more skilful at catching flies. Its attempts ceased to be clumsy, and misses were less frequent. Soon no flies escaped, but were all caught at first try.

Indeed, the mantis grew quite plump with regular feeding. In three weeks it grew about one-fifth inch. As this mantis was not yet fully developed, it lacked a great deal of the graceful form of the adult insect.

On one occasion I gave it a blowfly. It captured it in the usual way, but the strong vibrations of the fly's wings proved too much for it, and it escaped from its grasp. After another unsuccessful attempt it captured the blowfly, which was slightly maimed by now. It ate it in the usual way; the head first, and then the legs. A few days later I put another blowfly in the cage. This time the mantis caught it at the first attempt, but instead of devouring it straight away held it in its front legs and walked about a good deal. Next morning the blowfly was on the floor, but its head and a couple of its legs were missing. Obviously blowflies were too strong for this particular mantis, who rather relished the ordinary house variety.

On 11th March a large mantis flew in, so I caught it and put it in the cage with the other. This was a full-grown specimen, with long gauzy wings and long slender antennae. It was about two inches long, and of a much darker green than the younger one. It was also marked with brown where the other was inclined to be white, and had more brown about the legs and head. The tiny peacock-blue spot on the inside of each foreleg was prominent on both specimens.

The little mantis was very agitated at the arrival of its visitor. Whenever the big one made a move it would dash away, and then peer back to see what the other was doing.

On the morning of the 12th I was surprised to see that the young mantis had long gauzy wings and slender antennae, and was almost as large as the other. Then I saw the white shell from which it had emerged, clinging to the wire, and realised that it had gone through the last stage of its development, and was now a perfect insect.

It ate flies ravenously when I put them in the cage, but the other mantis refused to touch them. In two days he was dead, but the former occupant continued to live contentedly, making a meal of flies each day. He refused to eat a small, white moth, which I offered to him, but accepted a blowfly. When very hungry he would dart at a fly and eat it, even to the wings, but otherwise he would wait until the fly came close enough before capturing it and would cast the wings away, after the rest was eaten. After satisfying his appetite he would let the flies crawl over him without making any attempt to catch them.

About the 14th May I caught four flies, and put them in his cage. He took no notice of them, but kept restlessly moving about. The flies died without his attempting to capture them. On 16th May he died, after having lived about three months in captivity.

NOTES ON INSECTS.

By L. Gallard.

The Brown Passion Fruit Frog Hopper—Scolopopa Australe.

This small brown mottled winged insect is provided with a pair of clippers on the anal segment like the Cicada, with which it is able to nip up both the bark and the woody tissue of the tendrils of the passion vine to such a depth as to enable it to deposit its eggs right along the internal cavity. On examining the tendrils the rough incissions can be traced on the outside, and on splitting them down with a knife the tiny white oblong eggs can be seen neatly arranged along the central cavity at intervals of about 1-30 of an inch. In one tendril I counted 72 eggs. The larvae, which hatch from these eggs, are tiny little brown creatures with a little tuft of white down on the anal segment. They feed on the sap of the plant which they obtain by means of a sucker with which they pierce the bark. They develop by a series of moults like an ordinary plant bug.

The Green Passion Vine Frog Hopper, Siphanta Acuta.

Although it belongs to a different genus, resembles *Scolopopa* a good deal in shape, and in its nature and habits, but in its mode of egg laying it differs very widely. In this case the eggs are laid in a round patch on the leaves of the food plant. Only a few eggs are laid in the first row. Each succeeding row is headed on to the others, and the numbers are increased until the centre is reached. After this they recede so that when the work is completed we have a rather dirty looking, round, dark-brown patch somewhat resembling, in the distance, a patch of black soot, and in consequence they are often overlooked by the casual observer. Each of these patches contains about four dozen eggs. Although both of these insects like passion vines, and can always be found amongst them when they are about, they do not confine themselves to them, and are often found on other plants, both in the orchard and the bush.

On the temporary provision often made by the resting larvae of Neuropterous insects after their original Cocoons have been damaged.

The hollow silken hammocks in this exhibit show the temporary provision made by a resting larva of one of the Neuropterous *Porismus strigatus,* after its original cocoon had been broken open. This is quite a common occurrence with this family of insects. At first I used to think it was because the supply of silk left in their body was not sufficient to make another cocoon of the original type; but since I have considered the amount of silk in some of these hammocks, I have altered my opinion somewhat. I now think it is more, that the insect has arrived at a stage of development, that it is not capable of the movements necessary to enable it to construct the original type of cocoon, and it has to be contented with a one-sided structure. However, they appear to be comparatively happy in it, and often complete their development. In some cases the extra draw on their body, for this extra supply of silk proves too much for them, and causes them to dry up before they can complete their development. Although the old cocoons are left in the jar, and one would think it would be easier and better for them to crawl back and try and repair, or put up with the old one, they do not choose to do so. I have put them back myself and they would come out again.

EXCURSION, SUTHERLAND TO COMO.

The monthly excursion on 5th July, attended by 21 enthusiasts, took the form of a walk from Sutherland to Como, under the leadership of Miss R. Winter and Mr. E. H. Zeck.

Keeping to the ridge on the west side of the railway the typical poor sandstone country is fairly rich in those hardier types of Australian flora which seem to exist on nothing, but which have, through ages of hardship, adapted themselves to survive under such unfavourable conditions. Conspicuous among these were *Epacris microphylla* in full bloom. Other early flowerers were *Lysinema pungens*, *Acacia juniperina*, *A. suaveolens* and *A. rubida*. The needlebush, *Hakea acicularis*, was flowering profusely for another crop, while still carrying the unopened seed cases of past years—a characteristic common to a number of our bush plants and trees. Of the *Dillwynias, ericifolia* was the only one showing bloom. After crossing the railway and descending from the ridge into regions less exposed, the changed appearance of the bush was quickly noticed. While the billy boiled a small creek nearby was explored, and from its vicinity were taken some early specimens of *Boronia ledifolia, Eriostemon scaber, Chloranthus* sp., *Bauera rubioides, Conospermum longifolium* and *Isopogon anemonefolia*, all eager to display their gratitude for the improved conditions prevailing here.

This walk has the saving advantage of a pleasant down grade all the distance.

ENTOMOLOGICAL.—By E. H. Zeck. These consisted mostly of coccidae or gall insects, as follows:—*Ascellis schraderi,* a flattened blister-like gall. *A. praemollis,* the common round gall. *Apiomorpha pileata, A. Fletcheri* and *A. Thorntoni.* All on *E. corymbosa. Erio-coccus coriaceus,* a common eucalypt scale. *Cylindrococcus spiniferous,* the seed-like gall on *Casuarina* sp. *Sphaerococcus pirogallis,* small pear-shaped gall on *Leptospermum flavescens.* Chalcid galls and galls formed by mites were also taken on *E. corymbosa.* Several specimens of the small myrmecophilous silverfish were found in the nests of *Euponera lutea.*

NOTES AND COMMENTS.

CYRTOSTYLIS RENIFORMIS.—At the July meeting, Mr. Forster exhibited paintings of the above orchid, both the normal and the green variety. He mentioned that Rev. Mr. Rupp had recorded the green variety from Tasmania, but this appeared to be the first record for N.S.W. The specimen came from Bullabeela district.

Mr. McAuliffe sent the following note from a local paper:

CASINO'S RAIN TREE.

Sir,—Re Kyogle's rain tree. There is no necessity for going out of Casino to see water dripping from an apple tree (angophora subvelutina). Down near the railway gates you will find one that has been dropping water for years, to my knowledge, on the hottest days. It is not whitish gum, but froth, and in it you will find a number of white insects or bugs, which are the cause of the water issuing from the tree. They evidently puncture the bark and suck the juice. When the bark is punctured the sap issues quicker than the bugs can use it, and it falls in large drops. However, you will see trees in the scrub, from which you will find, at times, the sap issuing in jets, and covering all the plants underneath with sticky juice. I have watched the sap issuing from Amoora nitidula in fine jets, shooting up over two feet from the branches, like miniature fountains, and numbers of them issuing at the same time were very pretty and interesting.—Yours, etc.,

D. J. M.

Mr. H. E. Finckh.—The retirement of Mr. Finckh, our genial honorary treasurer, so well and favourably known to every member, is a notable event in the history of the Society. After 18 years' continuous service, carried out with energy, tact and enthusiasm, Mr. Finckh has found that pressure of other undertakings has rendered it necessary for him to relinquish the somewhat onerous duties of his position, and his resignation has been accepted with the greatest regret by the Council, as it will be received by members in general. In the earlier days of the Society Mr. Finckh placed a room in his business premises at the service of the Council for its meetings, he for years attended to the distribution of "The Australian Naturalist," acted as honorary lanternist, and in many ways served the interests of the Society. The numerous visits which our members have paid to Mr. Finckh's splendid aquarium and grounds, and the great interest in what we saw there, are not forgotten, nor is the generous hospitality with which we were always received by Mr. and Mrs. Finckh.

T. Steel.

Mr. J. H. Maiden.—In retiring from his position as Government Botanist and Director of the Botanic Gardens, Mr. Maiden brings to a close a long period of diligent and fruitful official service. To our Society Mr. Maiden has been a good friend, always eager to help serious students in every possible way, and our numerous visits to the Gardens under his care have been full of interest and instruction. Although retiring from official life, Mr. Maiden by no means retires from active work, he is too much engrossed in his life-work for that, but will continue to carry on those studies and researches which have rendered his name famous amongst botanists all the world over. Personally, the writer has been on many occasions deeply indebted to Mr. Maiden for facilities and assistance in his studies, always given with the utmost goodwill and generosity. All of us wish Mr. Maiden a very happy time in the midst of the flowers, which he loves so well, in his beautiful garden at Turramurra.

T. Steel.

OBITUARY.

Mr. H. G. Smith.—It is with the deepest regret that we place on record the passing hence of a very old and valued friend and colleague. The service to science which Mr. Smith carried out in his researches, in conjunction with Mr. R. T. Baker, on the chemical constituents of Australian plants, and notably of that wonderful genus, the eucalypt, besides those on the pines and numerous others, have carried the names of Baker and Smith round the scientific world.

These gentlemen were pioneers in this branch of work, and in spite of a certain amount of apathy and even of opposition, they saw their objective clearly and worked unflinchingly and diligently, until they compelled the admiration and appreciation of workers in all lands.

On more than one occasion Mr. Smith has laid before the Society some of the results of his work, explaining its significance and illustrating his remarks with most beautifully prepared exhibits. Much of his work has led to important commercial results, opening up lines of valuable uses for oils, dyes and other products of the eucalypt and others of our native plants, hitherto undreamt of, besides innumerable facts of great interest to pure science.

As an old friend, the Editor offers his tribute of respect and esteem to the memory of a true lover of science.

T. STEEL.

LINNEAN SOCIETY.—This month the Linnean Society of N.S. Wales celebrates its jubilee, it having been inaugurated on 29th October, 1874. What a splendid record of original work and research is contained in the numerous volumes of Proceedings published since then! The name of its founder and benefactor, Sir William Macleay, is deservedly held in respect and veneration.—Ed. *"A.N."*

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

ON THE ORCHIDS OF THE BULLADELAH DISTRICT OF NEW SOUTH WALES.

(REV. H. M. R. RUPP, Paterson, N.S.W.)

The district referred to in these notes comprises an irregular area lying about 60 miles to the north of Newcastle, and extending in a north-easterly direction from the middle portion of the Myall River Valley, across the northern end of the Myall Lakes, to the sea-coast near Smith's Lake, a few miles north of Seal Rocks. By far the greater portion of it is very rough hilly country covered with open forests with large tracts of typical "brush" and palm-scrub: but there are flats of dense Melaleuca scrub and characteristic coastal moors with peaty bogs, while a considerable area on the north-western shores of the Myall Lakes toward Bungwahl is now open pasture-land.

From the point of view of a botanist, the district thus introduced to your Society is the richest treasure-ground it has ever been the writer's good fortune to visit. In the leisure hours of 18 months' residence at Bulladelah, and in the course of a regular itinerary through the area referred to, I have collected upward of 700 species of indigenous plants, entirely exclusive of cellular cryptogams, and with very slight investigation of grasses, sedges and rushes.

Among the flowering plants, orchids are in great profusion. Within the period abovementioned I have observed 87 species of these fascinating plants. This is considerably more than a third of the total number of species known in New South Wales, and as it is obvious that there must be others which I have not seen, Bulladelah may claim to possess one of the orchid treasuries of the State. Twenty-one of those known to me are either epiphytic on trunks or branches of trees, or are restricted to rock-masses like those of the Alum Mountain (of which Bulladelah is the aboriginal name). The remainder are ground-plants. The genus Pterostylis heads my list with 14 species: Dendrobium comes next with 10—one of them, however, being doubtful. The distribution of local species among the various genera may be seen in the table below.

Several of the species show marked variations. I have observed distinct varieties in the following: Dendrobium Kingianum (2 forms), Dipodium punctatum (3), Corysanthes aconitiflores* (2), Pterostylis curta (2), P. nutans (2), P. pedunculata (2), Eriochilus autumnalis (2), Caladenia carnea (3), Glossodia major (2).

Teratological specimens, showing abnormal growth, have been found in the case of Pterostylis Baptistii, P. curta, P. nutans and Caladenia coerulea.

Many orchids are, of course, easily collected, and still more easily observed. Even the man to whom wild flowers are merely "bush-weeds" is attracted by a good clump of Rock Lilies, or a mass of Pencil-Orchids on a swamp oak. But there are many which call for diligent and patient search, and when you have found them they are sometimes "so near and yet so far"—out of reach, unless you have assistance, or some apparatus to help in a stiff climb. The smaller Prasophylla are often difficult to see.

The most widely distributed and abundant orchid in the Bulladelah district is probably Acianthus fornicatus. It may be found in every type of country except bog-land and, perhaps, open pastures. On sandy moors, on hard clay flats, on arid hills, in rock crevices, in rich forest gullies, and on the very edge of dense brushes, it is equally at home, and without any apparent variation, except in size. It seems to grow most vigorously on the sides of gullies in open forests, where I have seen it up to 12 inches in height.

A complete list of the orchids I have observed in the district is given below. Some are so familiar that they need no comment, but it is interesting, even in the case of common and familiar flowers, to notice how some of them vary, according to their habitat, and how they are able to adapt themselves to climatic and other conditions. As an example, let us take one of the commonest and most widely distributed ground orchids of eastern Australia, the little Eriochilus autumnalis. In my own herbarium specimens it extends from the western highlands of Tasmania to New England, and the North Coast, in N.S.W. Now it appears to be essentially a flower which dislikes extremes of temperature, because, in spite of the many and varied climates it must encounter between the limits just mentioned, it secures a fairly even temperature everywhere for its blossoms by the simple expedient of varying its flowering time. As a general rule, we expect to find the same flower blossoming later in a cold climate than in a warm one. If you follow this rule in looking for Eriochilus you will be disappointed. Search for it in Tasmania after it has finished flowering in Sydney localities, and you will search in vain. You must seek it much earlier. On the high Middlesex Plains, en route to Cradle Mountain, it flowers in January, and is not an autumn flower at all. In the same month I have gathered it on the banks of the Tamar below Launceston, though in warm and sheltered spots with an easterly aspect, if the season is mild, it lingers on through March. Cross the Straits to the mainland, and you will find that, speaking generally, the further north you go, the later Eriochilus is in its prime. The exception will occur when it invades high cold country, and there you will find it earlier, not later. In the Bulladelah district it is at its best from the last week of April to about mid-May, and you may still get it in June. On the western slopes of New England it likes April; on New England itself you will find it most abundant in March.

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* The specific name *"aconitiflores"* of Salisbury has priority over Brown's name *"bicalcarata,"* so that it should be *C. aconitiflores* (Salisb.) Druce (*C. bicalcarata* R.Br.) [Edwin Cheel].

The notes which follow on various orchids of the district may be found of interest to lovers of the flowers.

One of the most treasured specimens in my herbarium is a solitary plant, determined by Dr. R. H. Rogers, of Adelaide, as Caladenia tutelata. On the lower western slopes of the Alum Mountain, late in September, 1923, I found 2 flowers whose appearance suggested hybridising between Glossodia major and Caladenia carnea. As this seemed a venturesome theory, I sent one to Mr. J. H. Maiden for the National Herbarium. The other I have retained, but forwarded it to Dr. Rogers, a recognised authority, for his opinion. Mr. Maiden reported that the flower resembled one figured by Fitzgerald (Plate 28), but was not quite identical. Dr. Rogers returned the other with the opinion that it was identical with what he had recently described as a new Victorian and South Australian species under the name Caladenia tutelata. He had been disposed to regard it as originating by hybridisation of Glossodia major with Caladenia deformis, but upon learning that, so far as I could ascertain, the latter was not recorded north of Sydney, he felt that this was unlikely. It resembles a Glossodia, but has the column of a Caladenia, and the labellum bears a few yellow calli, and is yellow-tipped. The leaf is ascending.

One of the most striking of the local orchids is to be found among the Pterostyles or Green-hoods, of which it is surely King—P. Baptistii. I had never seen this plant except in a dried state in the National Herbarium at Sydney. It was supposed to be rare, and in some quarters was regarded as practically extinct, for the Port Jackson localities where it was recorded have long been built over, and there were but scant records of its existence elsewhere. There was, however, a specimen from Port Stephens; therefore as spring approached I kept a good look-out. For this happily there was little need. The plant may be found throughout the whole of the district embraced in these notes, and in many places it is in great abundance. Generally speaking, it is about 12 to 15 inches in height, but may reach twice that measurement, or be occasionally quite dwarf. The basal leaves are in a rosette, the stem leaves usually, but not always, reduced to clasping bracts. The single terminal flower is very large (sometimes over 3 inches from base to tip of galea), the galea bent over from about the middle in a graceful curve. The lobes of the lower lip extend with fine points far beyond the galea, which toward its summit is as often brown as green. The flower is banded longitudinally with translucent white and green or brownish markings. Dr. H. L. Kesteven found a specimen, now in my herbarium, with two fully developed flowers.

On branches of Tristania laurina overhanging the Cooloongolook River, at Wootton, 14 miles from Bulladelah, I found a few plants of a robust *Sarcochilus* which looked like, and subsequently proved to be *S. divitiflorus.* I regard this as not only one of the most attractive, but one of the most remarkable of our indigenous species. Subsequently to the flowering time I found a regular "colony" of exceptionally large plants growing high up on *Eugenia Ventenatii* on the bank of the Myall River, two miles above Bulladelah. I moved one of the Wootton plants to my bush-house, where it did well. Slender racemes of buds push out from the short, stout stem below the crown of leaves, and grow to a length of from 6 to 18 inches. The buds may number up to 40, or even considerably more. For 2 or 3 months they remain very small, giving no promise at all of any striking development. Suddenly, within a few days, late in October, all simultaneously swell out, become elongated, and burst into full bloom, the flowers at the tip of the raceme being almost as large and as fully expanded as those at the base. The sepals and petals are linear, widely spreading, an inch or more in length, orange-coloured with dark blotches. The appearance is most striking and beautiful. Unlike the great majority of our epiphytic orchids (including other species of Sarcochilus), the flowers last but a day or two, and then wither as suddenly as they appeared.

Dendrobium Kingianum, locally called Pink Rock Lily, is found on the Alum Mountain cliffs, in company with the much larger and more familiar Rock Lily, *Dendrobium speciosum.* In places the rock is quite hidden by the dense growth of *D. Kingianum.* It is a more stunted plant here than on the sandstone cliffs of the upper Clarence, about Copmanhurst, but the flowers do not share this diminution of size. They are exceedingly attractive, of varying shades of pink, and a pure white variety occurs.

Galeola cassythoides, a climbing orchid, is fairly plentiful on the western slopes of the Alum Mountain, and I have seen it also about Bungwahl on the Myall Lakes. The colouring of this orchid seems to vary. In this district its flowers are dark brown outside and a beautiful old-gold inside, or occasionally quite yellow. Being borne in great profusion, and lying flat against the trunk of a tree or stump, they invariably attract attention. The dark, leafless stem climbs by means of suckers on short stalks opposed to the flowering branches, and I have seen it as high as 12 feet. It is reputed parasitic on roots, but this seems doubtful. Dr. H. L. Kesteven and I examined a large number of plants. We found the roots sometimes penetrating the bark of the tree-root, but were disposed to think this was merely to obtain moisture, not to feed on the sap of the tree. Many plants were flourishing at the base of stumps which have been dead for years and were decayed. We discovered a thread-like fungus in association with the roots, and thought it possible that *Galeola,* like *Dipodium,* lives in symbiotic relation with the fungus. I believe that Dr. McLuckie, of the Sydney University, is investigating in this direction.

Calanthe veratrifolia is one of the noblest of our ground orchids, a denizen of moist brushes and palm scrubs. Its large handsome ribbed leaves qualify it for a place in any bush-house as a foliage-plant alone. It throws up a stout flowering stem to a height of from 2 to 4 feet. The flowers, an inch or more in diameter, are pure white, in a somewhat crowded raceme at the top of the stem.

Pterostylis grandiflora. Mr. Forster has painted this from Bankstown specimens. I have not seen it in that locality, but I collected it a few years ago at Northwood and Longueville. The Bulladelah plant is superior to any I saw on Lane Cove. The flower is larger, the galea broader and of a deeper red brown. In colour and form it is the most beautiful *Pterostylis* I know.

Spiculoea irritabilis. In Maiden and Betche's Census of N.S.W. plants (1916) this is listed as *Drakaea irritabilis* (Reichenbach). Dr. Rogers informs me that Lindley's name, *Spiculoea,* has been restored to it, Drakaea being now restricted to a few Western Australian species. *S. irritabilis* is not uncommon in late autumn on the lower western slopes of the Alum Mountain. It is a fascinating plant, with its curious hammer-like labellum, wonderfully articulated so as to strike down on the pollen masses. The plant has been described as leafless or possessing one radical leaf. This is a mistake. There are from two to four (most frequently two) well developed radical leaves somewhat resembling those of *Chiloglottis diphylla.* They are, however, imperfectly developed while the plant is flowering, and are at that stage often absent.

Microtis oblonga. It is not easy to distinguish the various species of *Microtis*, but it is certain that they are more numerous than has been supposed. *M. oblonga* is a species described and named by Dr. Rogers, who placed in it some Bulladelah specimens I sent him as *M. parviflora.* Besides the structural peculiarities described by Dr. Rogers, this species in the Bulladelah district grows taller than any other (up to 2 feet), and in bright weather is quite strongly scented like *Boronia megastigma.*

VARIATIONS.

The following are brief notes, indicating the variations mentioned in the earlier part of this paper.

Dendrobium kingianum. Typical form light or dark pink; variety pure white, rather rare.

Dipodium punctatum. Typical form exactly resembling that common about Port Jackson. Varieties: (1) A more robust plant with light green stem; flowers almost mauve, very faintly marked with red. (2) A very slender form with a dark stem; sepals and petals outside pink spotted with red; inside very dark red, sometimes with a few pink blotches.

Corysanthes aconitiflores. A variety occurs with the "helmet" of a dingy white colour.

Pterostylis curta. One form is considerably larger than the other with rich brown markings. The smaller form is slender, with flowers quite green.

Pterostylis nutans. What appears to be the variety *hispidula* occurs on the Bungwahl and Wootton roads.

Pterostylis pedunculata. Two very distinct forms. (1) Is identical in all respects with the southern type found in Victoria and Tasmania. (2) Tall and very slender, with a dark stem and a very small flower almost wholly dark red-brown.
of the Myall Lakes, on wet, "crab-holey" ground there grows

Eriochilus autumnalis. Near Topi-Topi, on the north-west
in abundance a robust form, larger in all its parts than the type. The flowers are often dark pink, almost rose-red.

Caladenia carnea. Three distinct forms. (1) The normal type. (2) A very small and slender white-flowering form, in and about swamps, between Bungwahl and Seal Rocks. (3) A remarkably large and brightly coloured form growing on peaty moors near Smith's Lake. Flowers as much as two inches in diameter, with sepals and petals almost purplish-red.

POPULAR NAMES.

These are often very unsatisfactory, but it is extremely difficult to alter them. Picture my disgust when, on discovering a profuse growth of the largest and most gorgeously coloured crimson *Correa speciosa* I ever saw (near Smith's Lake) I learned that the local name was "Hens and roosters." I did not enquire why. Not a great many orchids have local names here. Glossodias are "larkspurs," a name also applied to *Thelymitra ixioides.* Calcana is not "Cockatoo" here, but "Bee Flower"—a much better name, though "Wasp orchid" would, I think, be better still. *Eriochilus* is the "Cockatoo" here: I venture to suggest "Autumn wings." Most species of *Pterostylis* are called "Parrot's Beak," though the name is really only appropriate to *P. nutans.* *Cyrtostylis* I have always called "Mosquito." *Calochilus* is naturally dubbed "Beardie," whichever species it may be. I need not comment on the "Rock Lily," and *Dendrobium teretifolium* and *D. Beckleri* pass muster as "Pencil Orchids." *D. linguiforme* is obviously "Tongue Orchid." My children and I call *Acianthus caudatus* "Doggie," because its odour suggests that of the "friend of man" when his hair is all wet. "Wild Hyacinth" is not inappropriate for *Dipodium*: I have heard it applied to *Thelymitra.* *Cymbidium* in this district is called

"Snake Flower": *C. canaliculatum* on the western slopes is "arrowroot" or "wild banana" (from the appearance of the fruit). "Double tail" is an obvious name for *Diuris,* but personally I never heard a *Diuris* so called. In Tasmania *D. longifolia* was called "Donkeys," the prominence of the upper petals being regarded rather than that of the lower sepals, but I protested against this name for so beautiful a flower. Years ago, when I was at school in Geelong, I remember a boy bestowing upon *Corysanthes* the designation, "Sitting down orchid," and the name has stuck in my mind ever since. It may not be elegant, but it is certainly descriptive.

ODOUR OF FLOWERS.

I say without hesitation that the poet's phrase of scentless bright flowers is a libel on our Australian flora. But a good many of our flowers are only noticeably fragrant on bright, sunny days, and this seems to me to apply particularly to orchids. The following local orchids may be claimed as distinctly fragrant: All the *Dendrobiums* on the list: *Sarcochilus Hillii, S. olivaceus, Cleisostoma, Cymbidium suave, C. Albuciflorum, Thelymitra carnea, Microtis oblonga, Lyperanthus suaveolens, Caladenia carnea, C. alba, C. testacea.*

Glossodia major has aromatic leaves (especially when dried), and the flower is odorous but hardly fragrant. *Liparis reflexa* and *Acianthus caudatus* both have objectionable odours.

I conclude with the complete list of the district orchids known to me. (See pages 225-228).

Placunanomia.—At the October meeting Miss Rose M. Winter exhibited the interesting shell *P. ione* belonging to the family Anomiidae which attach themselves to other shells becoming shaped to the contour of the host shell. They attach themselves by means of calcareous byssal plug, the product of a gland replacing the byssal gland (which is situated in the grove towards the base of the foot) and is elastic and adhesive: morphologically it is a calcified byssus. The foot, through not being used becomes almost useless, as the shell has not to fend for itself, so the byssal plug takes its place.

LIST OF ORCHIDS IN BULLADELAH DISTRICT, N.S.W.

Liparis reflexa, Lindl.	Apl.-May.—Alum Mt.
L. coelogynoides, v. M.	Aug.—Alum Mt.
Dendrobium speciosum, Sm.	Sep-Oct.—Alum Mt. Smith's Lake.
falcorostrum, Fitzg.	Oct.—Upper Myall.
tetragonum, Cum.	Sep.-Oct.—Creeks and brush forest.
aemulum, Br.	Aug.-Sep.— do. Chiefly on Tristania conferta.
Kingianum, Bidw.	Sep.-Oct.—Alum Mt.
gracilicaule, v. M.	Sep.—Myall R. Above Bulladelah only.
linguiforme, Swz.	Sep.-Oct.—All over distr.
monophyllum, v. ?	? Wootton Rd. Doubtful, flower not seen.
teretifolium, Br.	Aug.-Sep.—All over distr. Chiefly on Casuarina glauca.
Fairfaxii, Fitzg. & v. M.	Sep.—Upper Myall.
Beckleri, v. M.	Oct.—Myall Lakes. do do
Bulbophyllum Shepherdi, v. M.	Sep.-Nov.—All over dist. In brushes and on cliffs.
aurantiacum, v. M.	Fl. any time. Girvan (Dr. H. L. Kesteven).
exiguum, v. M.	Mar.-Apl.—All over dist. In brushes and on cliffs.
Elisae, v. M. ?	? Wootton Rd. In brushes, doubtful.
Sarcochilus Hillii, v. M.	Nov.-Jan.—Brush forests.
divitiflorus, v. M.	Late Oct.—Wootton, Myall Rd.
olivaceus, Lindl.	Oct.-Nov.—Brush forests.
falcatus, Br.	Sep.—Upper Myall
Cleisostoma tridentatum, Lindl.	Sep.-Nov.—Brush forests.
Beckleri, v. M.	Sep.-Oct. do
Dipodium punctatum, Br.	Summer.—All over dist. Chiefly dry hill side.
Cymbidium canaliculatum, Br.	Nov.—Alum Mtn. East side only, seen high up on a Eucalypt.
suave, Br.	Nov.—All over dist. Not common.
albuciflorum, v. M.	Nov.-Jan. do. Abundant.

Calanthe veratrifolia, Br.	Dec.-Mar.—Brush forests.
Galeola cassythoides, R.	Sep.-Oct.—Alum Mtn. Bungwahl.
Spiranthes australis, Lindl.	Dec.-Apl.—All over dist. Chiefly moist grass land.
Gastrodia sesamoides, Br.	Oct.—Shallow gullies. Chiefly in association with Gahnia aspera.
Calochilus campestris, Br.	Sep.-Oct.—All over dist.
paludosus, Br.	Sep.-Oct.— do. Often on dry hill sides.
Robertsoni, Br.	Sep.-Oct.—Myall R. On damp moors, 7 miles below Bulladelah.
Thelymitra ixioides, Swz.	Sep.-Oct.—All over dist. Not common and never of the size, abt. Port Jackson.
longifolia, Br.	Sep.-Oct.—Lower Myall.
nuda, Br.	Sep.-.Oct.—All over dist.
carnea, Br.	Sep.-Oct.— do. Chiefly on flats.
Diuris aurea, Sm.	Sep.—Near Bulladelah.
elongata, Swz.	Sep.-Oct.—Near Bulladelah. More slender than usual, with shorter lateral sepals. Not fragrant.
bracteata, Fitzg.	Aug.—Topi Topi: Rosenthal.
sulphurea, Br.	Oct.—All over dist. Not common, small form.
pallens, Benth.	Sep.—Grassy hills. My specimens were found by Dr. H. L. Kesteven.
Cryptostylis longifolia, Br.	Dec.-Jan.—All over dist. Wet places. Measured 2 ft. 11 in. at Smith's Lake.
erecta, Br.	Dec.-Feb.—Smith's Lake. Smaller and later than at Pt. Jackson.
Prasophyllum elatum, Br.	Sep.-Oct.—Stroud Road. Smaller than at Pt. Jck.
striatum.	Alum Mtn., rare.
brevilabre, H.	Sep.—E. side Alum Mt.

Woollsii, v. M.	Apl.-June.—W. side do.
nigricans, Br.	do. do.
filiforme, Fitzg.	Feb.-Mar.—Near Bulladelah.
Microtis porrifolia, Spreng.	Oct.-Nov.—All over dist. Chiefly on open pasture land.
parviflora, Br.	Oct.-Nov.— do. Chiefly in open forest.
Microtis oblonga, Rogers.	Oct.-Dec.—All over dist. Fragrant like Boronia megastigma.
Corysanthes pruinosa, Cun.	May-Aug.— do.
aconitiflores, Salis.	do. Alum Mtn.
* undulata, R. Cunn.	June.—Alum Mt.
Pterostylis ophioglossa, Br	Winter. Smith's Lake.
concinna, Br.	Do. do.
curta, Br.	July-Sep.—All over dist.
acuminata, Br.	Apr.-July.—Smith's Lake: Myall R.
Baptistii, Fitzg.	Aug.-Oct.—All over dist.
nutans, Br.	June-Sep.— do.
pedunculata, Br.	Aug.-Oct. do.
grandiflora, Br.	May-July.— do.
reflexa, Br.	May-July.—Bungwahl.
obtusa, Br.	Autumn.—All over dist.
parviflora, Br.	Early autumn.—Bungwahl.
cycnocephala, Br.	July-Sep.—Bulladelah.
squamata, Br.	Sep.—Myall R., Rosenthal (Dr. Kesteven).
longifolia, Br.	July-Sep.—All over dist.

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*A small Corysanthes found in June, 1924, growing plentifully under *Melaleuca nodosa*, has been determined by Dr. R. S. Rogers as Cunningham's *C. undulata*, not recorded since 1833.

Caleana major, Br.	Sep.-Jan.—All over dist. Chiefly but not exclusively on sand.
Spiculoea irritabilis, Lindl.	Apl.-July.—Alum Mtn., Crawford River.
Acianthus caudatus, Br.	Aug.-Sep.—All over dist.
Acianthus fornicatus, Br.	May-Aug.—All over dist.
exsertus, Br.	Apr.-May.—Alum Mt.
Eriochilus autumnalis, Br.	Apl.-June.—All over dist.
Lyperanthus nigricans, Br.	Sep.-Oct.—Smith's Lake. Smaller than southern and W.A. forms.
suaveolens, Br.	Sep.-Oct.—All over dist. Flowers often green.
Cyrtostylis reniformis, Br.	June-Aug. do.
Caladenia carnea, Br.	Sep.-Oct.— do.
alba, Br.	June-Aug.— do. Less common than C. carnea.
coerulea, Br.	July-Aug.— do. Abundant on Tea Gardens Road.
testacea, Br.	Sep.-Nov.— do. On dry hill sides.
tutelata, Rogers.	Sep.—Alum Mtn. Rare.
Chiloglottis diphylla, Br.	Mar.-July.—All over dist. Often not flowering. Very small here.
Glossodia major, Br.	Aug.-Sep.— do.
minor, Br.	Aug.-Sep.— do. A little earlier than G. major.

The paper was illustrated with a series of 60 drawings by Mr. A Forster.

GENUS.	Number of Species.
Pterostylis *	14
Dendrobium †	10
Caladenia *	5
Diuris *	5
Prasophyllum *	6
Thelymitra *	4
Bulbophyllum †	4
Sarcochilus †	4
Cymbidium †	3
Calochilus *	3
Microtis *	3
Acianthus *	3
Corysanthes *	3
Glossodia *	2
Lyperanthus *	2
Cryptostylis *	2
Cleisostoma †	2
Liparis †	2
Dipodium *	1
Calanthe *	1
Galeola *	1
Spiranthes *	1
Gastrodia *	1
Caleana *	1
Spiculoea (Drakaea) *	1
Eriochilus *	1
Chiloglottis *	1
Cyrtostylis *	1
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* Terrestrial plants.

† Epiphytic on trees or restricted to rock, or growing on both.

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NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor

THE PLANTS OF THE BIBLE.

COMMENTS BY W. M. CARNE.

Having spent something like two and a half years in Palestine and Syria, and another six months in the Desert of Et-Tih. Mr. Steel's paper in a recent *Naturalist* (V. 1924, 133), brings back many memories.

Mr. Steel unfortunately overlooked a small publication entitled *The Plants of the Bible,* prepared for the American Colony at Jerusalem by their botanist, Mr. Dinsmore, and issued (2nd Edition) just before the war. It does not bear his name, nor do his other publications, probably owing to some rule of his Society. Though practically unknown, except to his correspondents, I regard Mr. Dinsmore as the greatest authority on Palestinian plants. To know him and his work, and to realise that for over twenty years he has searched the country through and through, is necessary for due appreciation. I also wish to place on record my appreciation of his kindness and assistance to me—the only botanical assistance I could get from Cairo to Damascus.

The following comments on Mr. Steel's article are based upon Dinsmore's *Plants of the Bible* and his *Jerusalem Catalogue of Palestine Plants*, and on Posts' *Flora of Syria and Palestine,* and my personal experience.

Boxwood.—Buxus longifolia (not *B. latifolia*), though in Syria, does not occur in Palestine or the Lebanon. The Hebrew word te'ashur means erect, tall, while box is shrubby. It is probable Box and Gopher both denote *Cupressus sempervirens,* which is planted in cemeteries throughout the land.

Cedar-wood, mentioned under Cedar, is probably *Juniperus phoenicea,* not *J. excelsa.*

Apple.—Mr. Dinsmore favours the quince as the correct translation of the Hebrew *"tappnach"* as "From the references we know that the fruit is sweet, fragrant and yellow, and that the tree is a common one." The true apple is not common, and is poor in quality, so that the abundant quince (the Apple of the Hesperides) seems more probable. The citron is ruled out by its bitterness.

Bay.—This refers to any flourishing species of tree.

Fir, Pine, Box.—Mr. Dinsmore suggests these to be: Fir, *Abies cilicica*—fir; Pine, *Juniperus excelsa*—juniper; Box, *Cupressus sempervirens*—cypress.

These trees with Cedar (*Cedrus libani*), and Pine (*Pinus halepensis*) are the principal ones of Lebanon.

Oak.—Abraham's Oak at Hebron is *Quercus palaestina* (*Q. coccifera* var. *pseudococcifera*).

Sycamore (*Ficus sycomanus*).—This is one of the largest trees in Palestine. At Khan Yimus there is a row over 40 feet high. Post says they attain 45 feet, which makes it a giant amongst trees in Southern Palestine. The timber was used in Egypt for mummy cases.

Willow.—The true willow is rarely found wild. Most Bible references to "willows of the brook" probably refer to the Oleander, and "Osiers" to the Chaste-tree (*Vitex agnus–castus*).

Wheat.—The common wheats of Palestine are Durums or Macaroni wheats. Spelt is not known to Dinsmore, Post, or Aaronsohn (Agric. and Bot. Explorations in Palestine). It is interesting that a wild Emmer (*Triticum dicoceum dicoccoides*) has been found in the Mt. Hermon area, which is believed to be a form of the original wheat. Emmers in Egypt and probably Palestine, passed out of use before historical times, though found in tombs of the 1st Egyptian dynasty 4,000 years before the Christian era. The durums even then were grown.

Millet.—*Panicum miliaceum* is not grown in Palestine to-day, nor does it occur wild.

Hyssop.—Dinsmore favours *Origanum maru* as the origin of this. In modern times the leaves are ground, and the powder used as a condiment by the natives.

Gourd is probably *Citrullas colocynthis.*

Cucinbita pepo is not a native or wild plant.

Tamarisk (see under Manna).—This is not a *Fraxinus,* but one of the species of *Tamarix* so common in Palestine.

Mustard.—Dinsmore considers this translation correct, and the plant to be *Sinapis alba.*

Salvadora Persica grows principally around the Dead Sea. Various species of *Sinapis* occur, and are found everywhere. White mustard is especially common around the Sea of Galilee.

Balm of Gilead is as stated by Mr. Steel.

The Russian monks at Jericho prepare a balsam from a tree common there, *Balsamites Aegyptiaca,* and call it Balm of Gilead, but there is nothing to justify this.

Trusting that these notes may interest readers of Mr. Steel's article.

Reply by Thos. Steel.

I have read with much interest Mr. Carne's comments on my paper, and welcome his discussion as an aid to a clearer understanding and fuller knowledge of a somewhat intricate subject. It is not surprising that I never heard of Mr. Dinsmore's publications, seeing that they were issued anonymously and apparently circulated privately. I would offer a few remarks in reply to Mr. Carne.

Box-wood.—Mr. Carne is quite correct in naming this *Buxus longifolia,* my use of *latifolia* was a mistake in transcription.

Mr. Carne says that this tree does not occur in Palestine. Dr. A. B. Rendle, Keeper in Botany, British Museum, says the native box-tree of Palestine is *B. longifolia,* "a small evergreen tree about 20 ft. high." A tree of 20 ft. could scarcely be termed "shrubby."

Sir J. D. Hooker and Canon Tristram, in the Students' Bible, indicate that the particular species is uncertain, but state that *B. longifolia* grows on Lebanon.

I am still inclined to think that Box should not be classed with *Gopher,* the former being, I think, *B. longifolia,* and the latter *Cupressus sempervirens.* This is the identification considered most probable by Rendle, while Hooker and Tristram adopt *Cypress* as the translation of *Gopher.* Balfour considers Box as being *B. sempervirens,* and *Gopher* he states "is supposed to be the produce of the *Cypress* or some other pine."

Cedar-wood.—The wood mentioned in Lev., 14 ch., 4, and Numb, 19 ch., 6, is considered by Balfour to be *Juniperus excelsa,* a tree which he states is common in Palestine, associated with the Cedar of Lebanon. Rendle does not name it, but refers it to a fragrant species of *Juniper.* It is quite probable that Mr. Carne may be correct in identifying it as *J. Phoenicea,* though it is equally probable that either species was used indifferently. The important point is that it was not Cedar.

Apple.—I am not quite satisfied with Mr. Carne's view that quince is the correct rendering of the word translated "apple." Careful reading of the references in Song. Sol., 2 Ch., 3, 5; 7 Ch., 8; 8 Ch., 5 and Prov., 25 Ch., 11, indicates a fragrant ornamental tree with a grateful shade, rather than a useful one, and, although the quince was common, it is not a delicate fruit, but rather coarse, probably requiring cooking before use, nor is the tree fragrant. Reference to Josephus shows that branches of citron were in regular ritual use amongst the Jews, and so the tree must have been freely grown.

Certainly opinion on the identity of the tree is divided, amongst authorities. Rendle, following Hooker and Tristram, considers the Apricot (*Armeniaca vulgaris*) as the most probable, because of the sweetness and beauty of its fruit. Mr. Carne states that the Citron is ruled out because of its bitterness. The Enc. Britt. states that the Hebrew *tappuah*, rendered "apples" and "apple tree" in Song. Sol., etc., probably signifies the citron tree, a fragrant tree about 10 ft. high, and that the pulp is sub-acid and edible, the seeds bitter. It was "known to the ancients and the fruit was held in great esteem by them." I have no very decided opinion on the matter, but it appears to me that either the citron or apricot have a greater balance of probability than the quince. It is quite probable that the citron was used in the form of conserves, just as we use both sweet and bitter oranges.

Fir, Pine, Box.—These, again, are trees about which there exists a good deal of difference of opinion. In the case of the fir, Rendle favours *Pinus halepensis,* while Balfour decides for *Cupressus sempervirens.* I have not before seen *Abies cilicia* suggested. A good deal of rather free translation has occurred under the name "pine." Thus Isa., 44 Ch., 14, the word translated "ash" probably refers to a species of pine, and in Neh., 8 Ch., 23, the term *ec shemen,* translated "pine-branches" is elsewhere correctly rendered "oil-tree."

I have already dealt with the references to box.

Oak.—Evidently the name *Q. pseudococcifera,* quoted by me for Abraham's oak is merely a synonymy of that given by Mr. Carne.

Sycamore.—It is true that this is a large tree, with low spreading branches, easily climbed.

Wheat.—My authority for stating that the wheat of Palestine is Spelt, is Rendle, who says:—"The form now most generally grown in Palestine is Spelt (*Triticum spelta*)." Hooker and Tristram merely mention *T. vulgare, T. spelta* and

T. compositum, without comment, and then go on to state that the two principal varieties cultivated are the summer and winter wheats (*T. aestivum* and *T. hybernum*). It seems strange that the authorities quoted by Mr. Carne are unacquainted with Spelt.

Millet.—Here again Mr. Carne differs from Rendle, who states that both *Panicum miliaceum* and *Sorghum vulgaris* are cultivated in the Holy Land, and this view is also expressed by Balfour. Hooker and Tristram describe millet as:—"The small grains of various large cultivated grasses, of the genera *Panicum, Setaria* and *Sorghum.*" If Mr. Carne is correct in his observations, they may have gone out of cultivation since Bible times.

Hyssop.—I still think that the caper (*Capparis spinosa*) best answers the various references to hyssop. I am aware that marjoram (*Origanum*), has been suggested, as has also the mint-like plant *Satureia,* but neither of these meets the reference in Psa., 51 Ch., 7, to the use of the flower buds for their cleansing saponaceous qualities, nor to the description "springeth out of the wall" (1 Kings, 4 Ch., 33). Rendle describes the plant as a bright green creeper, the long stems of which hang from the fissures of the rocks in the desert, and which is plentiful in Egypt and the desert of Sinai.

Gourd.—There has been much difference of opinion amongst commentators as to the true nature of Jonah's gourd, even from the days of Jerome and Augustine, who accused one another of heresy over the matter. In Jonah, 4 Ch., 6-10, the Hebrew *Kikayon,* has, I think, been correctly identified as *Cucurbita pepo,* a climbing plant of rapid growth, and suitable for covering the booth in which Jonah sat. Though it may not be a native, it appears to have been in cultivation. The wild gourd which was used in pottage (2 Kings, 4 Ch., 38-40) is referred to in the Hebrew as *paqquoth,* a totally different word, and from its nature was probably the colocynth (*Citrullus colocynthus*).

Tamarisk.—A number of works which I have consulted, amongst which may be mentioned Watt's Dict. Chem. III., 1875, 821; Attfield, Chemistry, 1903, 517; Squire. Comp. to Brit. Pharmac., 1894, 354; Martindale and Westcott, Extra Pharmac., 1906, 742; state that manna is a product of *Fraxinus* and do not mention *Tamarix.* The Enc. Britt. gives manna as a product of *Fraxinus ornus,* and goes on to say that *Tamarix* manna in the form of honey-like drops, which, in the cool of early morning, are found in the solid state, is collected by

Arabs and sold to the monks of St. Catherine, who supply it to pilgrims.

The point of importance is that there were two kinds of manna, the lichen (*Lecanora esculenta*) and the sweet tree manna. From the fact that both *Tamarix* and *Fraxinus* grew in the desert and both yielded this product, it is highly probable that the sweet manna included the product of both trees. But this is a matter of less moment than the fact of there being the two different kinds. Mr. Carne does not state his reasons for referring to *Tamarix* as the sole source of this substance.

Mustard.—Christ's description of the mustard tree is so definite and precise as to leave no doubt as to the sort of tree referred to. The smallness of the seed and the large size of the tree "the greatest among herbs." "A great tree, shooting out great branches." *Sinapis* is a soft-stemmed annual which has been stated to sometimes grow to a height of 8–9 feet, just as many similar plants grow in Palestine and elsewhere, when conditions are favourable. In New South Wales I have seen such common annuals as *Erigeron linifolius, Chenopodium album* and *Tagetes minuta* grow to a similar stature, but would never think of calling them "great trees." To call *Sinapis* at its loftiest "a great tree" with "great spreading branches," would be gross exaggeration and Christ was not given to exaggeration.

On the other hand, in the mustard tree (*Salvidora Persica*) we have a tree exactly answering Christ's description, the seeds of which are to this day termed *Chardal* or *Khardal* (mustard) by the Arabs, and when ground are used as such. The seed of *Sinapis* is quite a large one. Dr. Royle, quoted by Prof. Balfour, states that *Salvidora Persica* grows near Jerusalem, and most abundantly on the banks of the Jordan and around the Sea of Tiberias. The trunk is sometimes 25 ft. high, with a diameter of one foot. The berry is very small, much less than a grain of black pepper, smooth and red.

Osier.—This is a plant which I did not mention. Under the title "Osier" Miller's Dict. of Plant Names, 1884, p. 100, enumerates seven different osiers, six of which belong to the genus *Salix,* including the common osier (*S. viminalis*), and one, the green osier (*Cornus florida*), but does not mention the chaste-tree (*Vitex agnus–castus*), the plant given by Mr. Carne. I have not previously seen this plant classed as an osier.

ORDINARY MEETINGS.

September 2nd.—Mr. Watson (President) in the chair. Mr. Spong was elected a member.

Mr. Gallard a number of interesting entomological specimens, as detailed in last issue. Mr. Watson showed preserved plants for the use of children, protected in glass frames. They can be handled with impunity.

Mr. Kinghorn delivered a most useful lecture on snakes, in which he described the principal characters of the more important species, their appearance, habits, etc., and finished by advising people to carry "Burton's First-aid for Snake Bite" for use in the bush.

October 7th.—The President (Mr. Watson) in the chair, and a very fair attendance. A number of members contributed botanical and entomological exhibits of interest. Dr. E. C. Chisholm, of Comboyne, sent an entomogenous fungus (*Cordyceps* sp. ?) parasitic on larva of a wood moth.

Mr. Morris gave a most interesting account of the flora of Broken Hill district, illustrated with lantern slides, showing what good work he and Mrs. Morris had done amongst the local flora. In moving a vote of thanks, Mr. Cheel complimented Mr. and Mrs. Morris on their excellent work, and asked how he germinated Quandongs. In reply, Mr. Morris said he generally cracked the shells of the nuts before planting. He thanked the members for their appreciation.

November 4th.—Mr. Watson (President) in the chair, and about 37 members present.

Mr. P. E. B. Barnett exhibited *Cladonia retepora* from Berrima, with note. Mr. H. E. Finckh specimens of *Riccia fluitans* and *R. natans* from Bulladelah, with note. Miss Holland live specimens of Nardoo (*Marsilia*) from Western Plains, the leaves and spores of which were used by the explorers, Burke and Wills.

The following members contributed lantern slides:—Mr. P. Murray, platypus and sundry marsupials; Dr. Mackerras, insects under natural conditions; Mr. A. G. Hamilton, wasps, frogs and plants of the family Rutacaea; Mr. Froggatt, views in New Hebrides, also silkworms; Mr. H. E. Finckh, birds and fish; Mr. White, aquatic pictures and scenes in England and Australia; Mr. Powell, a miscellaneous collection from England, comprising fossils from various horizons, minerals and pebbles; also specimens of implements, etc., from an old lake dwelling.

December 2nd.—The President (Mr. A. Watson) in the chair, and a very fair attendance. The President announced the receipt of a parcel of seeds of the desert pea (*Clianthus*) for distribution.

Mr. A. Musgrave, of the Australian Museum, gave a most interesting lecture on Lord Howe Island, its geological and physiographical features, flora and fauna, illustrated with lantern slides, taken and coloured by Mr. Musgrave himself. The depredations of the introduced rat were described, and the means taken to deal with the pest by the introduction of the Boobook and Delicate owls was mentioned. These birds are doing great service. The luxuriant flora, including the giant heath, *Dracophyllum fitzgeraldi* were well illustrated. On the motion of Mr. Hall and Mr. Costelow, a cordial vote of thanks to Mr. Musgrave was carried by acclamation.

February 3rd.—The President in the chair, and a good attendance. Mr. Sykes, of National Park, was elected a member. A number of interesting exhibits was brought forward by members.

Mr. A. A. Hamilton spoke of the departure of Misses Butler and Harris for Deniliquin and Murwillumbah, and of their good work in connection with the society, and moved that a letter of appreciation be sent to them both. Seconded by Miss Moulsdale and Mr. Gallard, and carried by acclamation.

Mr. D. G. Stead gave a very interesting account of his stay in Hawaii and Honolulu as representative at the Pan-Pacific Food Conservation Conference. The lecture was illustrated by beautiful coloured slides, and was much appreciated.

Miss McAnene read notes on a visit to Kurrajong Heights, the portion of which, on the bird life, was of exceptional interest.

March 3rd.—The President in the chair. Amongst the exhibits was a fine collection of Tabanidae, collected at Barrington Tops by Dr. McKerris.

Reference was made to the awarding of F.R.S. to Dr. Tillyard, and on the motion of Mr. Murray and Mr. Gallard, it was decided that a letter of congratulation be sent to Dr. Tillyard. Mr. Lang, a visitor from New Zealand, gave a most interesting account of botanical research in that country, beginning with Banks and Solander in 1769 down to the present time. Passing from that he briefly touched on taxonomic work, pointing out that the flora of N.Z. could be considered under four heads—(*a*) Endemic, (*b*) Australian, (*c*) Fuegan, (*d*)

Malayan. He showed that in the variation of climate the same species would often vary from a cushion plant to a tall shrub. On the motion of Mr. Cheel and Dr. MacKerras, a cordial vote of thanks was carried.

April 7th.—Mr. Watson in the chair. Mesdames English and Sherrill, and Misses Hewsted and Thomsen were elected to membership. After the usual interesting exhibits, the President read a paper on "From a Bush Note-Book," by Miss Irby, of Casino, which was received with much interest.

May 5th.—The President in the chair. It was announced that Miss Le Plastrier, owing to illness, had been forced to resign the position of Hon. Secretary. The regret of the members was expressed, and sympathy with Miss Le Plastrier, and the hope that with rest and care she would soon be able to resume her place in the interests of the Society. Mrs. Murray had kindly consented to act as Hon. Secretary till the end of the Society's year. It was also announced that Mr. Stead was unable through pressure of work to give the lecture on "The Splendour of the Bush," but had arranged for Mr. Froggatt to lecture in his place.

Mr. Froggatt then delivered a most interesting lecture on the Pillaga Scrub, describing the flora and fauna of the pine-forest lands and the uses of the cypress pine, and also gave a good account of the entomology of the scrub.

OBITUARY.

Mr. D. R. Hanly.—By the death of Mr. D. R. Hanly, of the Education Department, the Naturalists' Society has lost a highly-valued friend. As the Departmental officer associated with the letting of the Assembly Hall (in which our monthly meetings have been held for so long), and the large Exhibition Hall, in which two of our Natural History and Wild Flower Exhibitions have been held, Mr. Hanly was brought into very close touch with our retiring Secretary (Miss Le Plastrier) and myself. On all occasions his unfailing courtesy was only equalled by his kindness and readiness to assist us in every way that was officially possible.

Mr. Hanly was truly "one of Nature's gentlemen."

David G. Stead.

NOTES AND COMMENTS.

THE RABBIT PEST.—Members of the Naturalists' Society will be gratified to know that one of our foundation members, and past President, Mr. David G. Stead, has been given a Commission by His Excellency the Governor of the State of New South Wales, to enquire into and report upon the Rabbit Menace. Following are the heads of enquiry given in Mr. Stead's Commission:—

(1) The investigation of the various methods of controlling and exterminating rabbits, such as trapping, poisoning, fumigation, digging out, fencing and netting, destruction by disease, shooting, ferreting, hunting, etc.

(2) The effectiveness of the various methods and their relative costs.

(3) A close study of the life-history, habits, etc., of the rabbit, with a view of endeavouring to evolve a more effective method of control.

(4) The effect (as far as it is practicable to ascertain) upon other animals, as well as birds, useful insects and aquatic life throughout the country of any of the destructive agencies utilised: and the determination of whether any deleterious effects (if any) are outweighed by the benefits derived directly and indirectly from the consequent rabbit destruction.

Mr. Stead is further commissioned to recommend for adoption whatever measures he may consider might with advantage be introduced into the State of New South Wales.

In view of the appalling effect which the rabbit has had upon the whole life of this community—whether viewed economically, commercially, or from the naturalist's point of view of the consequent disturbance of wild Nature in these parts—Mr. Stead's investigations will be followed with the closest interest, not only by his fellow members in this Society, but by the public in general. He carries with him the hearty congratulations and best wishes of the members of the Naturalists' Society in the essaying of such an important and exacting task, for which his wide knowledge of animated Nature, and organising ability so eminently fit him.

RICCIA.—Exhibit at November meeting. *R. fluitans* and *R. natans.* It is interesting to find both these hepatics at the same time at one locality. They were received from the Rev. H. M. R. Rupp, of Bulladelah, where they were collected by Dr. Leighton Kestevan. *R. fluitans* was growing in a ball-shaped mass, larger than a cricket ball, showing the beautiful manner in which the thousands of plantlets cluster together.

H. E. FINCKH.

"CORAL LICHEN" (*Cladonia retepora*) found recently near Berrima, N.S.W., where a smaller but considerably coarser specimen had been found on a previous visit some months ago. Noticed over only a very limited area in the Berrima district, but has been found in various portions of N.S.W., including Mosman, also in Tasmania and New Zealand. Specially referred to by Mr. Cheel in recent issue of the "Naturalist."

P. E. B. BARNETT.

KURRAJONG HEIGHTS.—The following interesting notes on the bird life of this district are taken from a paper by Miss McAnene:—

Being seldom molested the birds are very trusting. Redheads' nests might be seen on many orange trees and on the bank by the house track a spine-billed honey-eater had its nest on the lawn, while a little tit built and laid eggs in a pot plant on the verandah. We were very fortunate in being able to observe a lyre bird dancing on his mound, while his mate watched from the branches of a tree a few yards away. We also watched him from a rock overlooking the gully. While resting from his graceful pirouetting, he gave an example of his wonderful mimicry. The characteristic "call" of thrush, robin, pallid cuckoo, crow, and the sound of running water were very cleverly imitated. When his mate noticed our approach she gave a warning cry and flew past the mound, while he scuttled through the bush. Later in the week we had another opportunity of listening to his wonderful mimicry. This time, not only were the previously mentioned "calls" given, but also the sound of wood-chopping, the notes of the currawong, magpie, kingfisher, pee wee, and a most wonderful imitation of the "laughing jackass." Our city "bird callers" were put quite in the shade.

The Council and members of the Society join in most sincere congratulations and best wishes for their future, to two of our most esteemed office-bearers, Mr. P. D. F. Murray and Miss M. Holland, on the occasion of their marriage.

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